THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants:	Boussemart, et al.
Appl. No.:	10/598,669
Conf. No.:	8693
Filed:	June 19, 2007
Title:	METHOD OF PREPARING FOAM FROM A MILK-BASED ALIMENTARY LIQUID AND METHOD FOR IMPLEMENTING THE SAME
Art Unit:	1782
Examiner:	Preston Smith
Docket No.:	3712036-00751

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS' APPEAL BRIEF

Sir:

Appellants submit this Appeal Brief in support of the Notice of Appeal filed on September 1, 2011. This Appeal is taken from the final Office Action dated August 25, 2011.

I. REAL PARTY IN INTEREST

The real party in interest for the above-identified patent application on Appeal is Nestec S.A by virtue of an Assignment dated June 19, 2007 and recorded at reel 019450, frame 0604 in the United States Patent and Trademark Office.

II. RELATED APPEALS AND INTERFERENCES

Appellants' legal representative and the Assignee of the above-identified patent application do not know of any prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision with respect to the above-identified Appeal.

III. STATUS OF CLAIMS

Claims 1-10 and 26-31 are pending in the above-identified patent application. Claims 11-25 were previously canceled without disclaimer. Claims 1-10 and 26-31 stand rejected. Therefore, Claims 1-10 and 26-31 are being appealed in this Brief. A copy of the appealed claims is included in the Claims Appendix.

IV. STATUS OF AMENDMENTS

A non-final Office Action was mailed on May 25, 2011, in which the Examiner rejected Claims 1-10 and 26-31 as being obvious under 35 U.S.C. §103. Appellants filed a Response to the non-final Office Action on August 8, 2011, in which Appellants argued against the obviousness rejections. The Examiner mailed a final Office Action on August 25, 2011 in which the Examiner maintained the obviousness rejections. Appellants filed a Notice of Appeal on September 1, 2011. Copies of the non-final Office Action, and final Office Action are included in the Evidence Appendix as Exhibits A and B, respectively.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A summary of the invention by way of reference to the specification and/or figures for each of the independent claims is provided as follows:

Independent Claim 1 is directed to a method of preparing foam from a milk-based alimentary liquid for preparing a drink using a device (page 1, lines 1-5; page 2, line 20-page 3, line 3) comprising a frame including a support for a container (page 2, line 20-page 3, line 3), said support being associated with heating means for heating said alimentary liquid contained in said container when the container is disposed on said support (page 2, line 20-page 3, line 3), mechanical stirring means extending at least partially into said container (page 2, line 20-page 3, line 3), means for driving said stirring means (page 2, line 20-page 3, line 3), and control and command means arranged for automatically controlling the command of said heating means and said drive means (page 2, line 20-page 3, line 3), said method comprising:

a) placing a quantity of alimentary liquid comprising milk in the container associated with said stirring means (page 2, line 20-page 3, line 3);

b) commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3); and

c) commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed generating foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3).

Independent Claim 26 is directed to a method of preparing foam from a milk-based liquid for preparing a drink (page 1, lines 1-5; page 2, line 20-page 3, line 3), the method comprising:

a) placing a quantity of alimentary liquid comprising milk in a container having a stirrer (page 2, line 20-page 3, line 3);

b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3); and

c) stirring said liquid with stirring means at a second predetermined stirring speed generating foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3).

Independent Claim 28 is directed to a method of preparing foam from a milk-based alimentary liquid for preparing a drink using a device (page 1, lines 1-5; page 2, line 20-page 3, line 3)comprising a frame including a support for a container (page 2, line 20-page 3, line 3), said support being associated with heating means for heating said alimentary liquid contained in said container when the container is disposed on said support (page 2, line 20-page 3, line 3), mechanical stirring means extending at least partially into said container (page 2, line 20-page 3, line 3), means for driving said stirring means (page 2, line 20-page 3, line 3), and control and command means arranged for automatically controlling the command of said heating means and said drive means (page 2, line 20-page 3, line 3), said method comprising:

a) placing a quantity of alimentary liquid in the container associated with said stirring means (page 2, line 20-page 3, line 3);

b) commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3; page 3, lines 14-19); and

c) commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3; page 8,line 29-page 9, line 11).

Independent Claim 30 is directed to a method of preparing foam from a milk-based liquid for preparing a drink (page 1, lines 1-5; page 2, line 20-page 3, line 3), the method comprising:

a) placing a quantity of alimentary liquid in a container having a stirrer (page 2, line 20-page 3, line 3);

b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed ranging of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3; page 3, lines 14-19); and

c) stirring said liquid with stirring means at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid (page 2, line 20-page 3, line 3; page 8,line 29-page 9, line 11).

Although specification citations are given in accordance with C.F.R. 1.192(c), these reference numerals and citations are merely examples of where support may be found in the specification for the terms used in this section of the Brief. There is no intention to suggest in any way that the terms of the claims are limited to the examples in the specification. As demonstrated by the references numerals and citations below, the claims are fully supported by the specification as required by law. However, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology as is done here to comply with rule 1.192(c) does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the references numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-4 and 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over Viennese NPL ("*Viennese*") in view of DE 10223444 to Guenou ("*Guenou*") and U.S. Publication No. 2002/0130137 to Greenwald et al. ("*Greenwald*"). Copies of *Viennese*, *Guenou*, and *Greenwald* are included in the Evidence Appendix as Exhibits C, D and E, respectively.

2. Claims 5-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Viennese* in view of *Guenou*, and *Greenwald* and further in view of U.S. Patent No. 6,283,625 to Frankel et al. ("*Frankel*"). A copy of *Frankel* is included in the Evidence Appendix as Exhibit F.

3. Claims 8-10 and 27-31 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Viennese* in view of *Guenou*, *Greenwald*, *Frankel*, U.S. Patent No. 4,537,332 to Brown et al. ("*Brown*") and U.S. Patent No. 5,374,444 to Langer ("*Langer*"). Copies of *Brown* and *Langer* are included in the Evidence Appendix as Exhibits G and H, respectively.

VII. ARGUMENT

A. LEGAL STANDARDS

Obviousness under 35 U.S.C. § 103

The Federal Circuit has held that the legal determination of an obviousness rejection under 35 U.S.C. § 103 is:

> whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made...The foundational facts for the prima facie case of obviousness are: (1) the scope and content of the prior art; (2) the difference between the prior art and the claimed invention; and (3) the level of ordinary skill in the art...Moreover, objective indicia such as commercial success and long felt need are relevant to the determination of obviousness...Thus, each obviousness determination rests on its own facts.

In re Mayne, 41 U.S.P.Q. 2d 1451, 1453 (Fed. Cir. 1997).

In making this determination, the Patent Office has the initial burden of proving a *prima facie* case of obviousness. *In re Rijckaert*, 28 U.S.P.Q. 2d 1955, 1956 (Fed. Cir. 1993). This burden may only be overcome "by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings." *In re Fine*, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). "If the examination at the initial stage does not produce a prima facie case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

Moreover, the Patent Office must provide explicit reasons why the claimed invention is obvious in view of the prior art. The Supreme Court has emphasized that when formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed. *KSR v. Teleflex*, 127 S. Ct. 1727 (2007).

Of course, references must be considered as a whole and those portions teaching against or away from the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). "A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged

from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant." *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998), quoting, *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994).

B. THE CLAIMED INVENTION

Independent Claim 1 is directed to a method of preparing foam from a milk-based alimentary liquid for preparing a drink. The drink is prepared using a device that includes a frame having a support for a container. The support is associated with heating means for heating the alimentary liquid contained in the container when the container is resting on the support. The device further includes mechanical stirring means that extend at least partially into the container, means for driving the stirring means, and control and command means arranged for automatically controlling the command of the heating means and the drive means. The method includes

(a) placing a quantity of alimentary liquid comprising milk in the container associated with the stirring means. The method also includes

(b) commanding, via the control and command means, the heating means associated with the support to heat the quantity of alimentary liquid to a predetermined temperature while commanding the driving means for the mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and

c) commanding, via the control and command means the mechanical stirring means for stirring the quantity of liquid at a second predetermined stirring speed generating foaming of the heated alimentary liquid.

Independent Claim 26 is directed to a method of preparing foam from a milk-based liquid for preparing a drink. The method includes

a) placing a quantity of alimentary liquid comprising milk in a container having a stirrer;

b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and

c) stirring the liquid with stirring means at a second predetermined stirring speed generating foaming of the heated alimentary liquid.

Independent Claim 28 is directed to a method of preparing foam from a milk-based alimentary liquid for preparing a drink. The drink is prepared using a device including a frame having a support for a container. The support is associated with heating means for heating the alimentary liquid contained in the container when the container is resting on the support. The device further includes mechanical stirring means extending at least partially into the container, means for driving the stirring means, and control and command means arranged for automatically controlling the command of the heating means and the drive means. The method includes

a) placing a quantity of alimentary liquid in the container associated with the stirring means;

b) commanding, via the control and command means, the heating means associated with the support to heat the quantity of alimentary liquid to a predetermined temperature while commanding the driving means for the mechanical stirring means at a first predetermined stirring speed of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid. The method further includes

c) commanding, via the control and command means the mechanical stirring means for stirring the quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid.

Independent Claim 30 is directed to a method of preparing foam from a milk-based liquid for preparing a drink. The method includes a) placing a quantity of alimentary liquid in a container having a stirrer; b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed ranging of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid; and c) stirring the liquid with stirring means at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid.

C. THE REJECTION OF CLAIMS 1-4 AND 26 UNDER 35 U.S.C. §103(a) SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully request that the Board reverse the rejection of Claims 1-4 and 26 under 35 U.S.C. §103(a) because the Examiner has failed to establish a *prima facie* case of obviousness. In this regard, Appellants submit that *Viennese*, *Guenou*, and *Greenwald* fail to disclose or suggest each and every element of the present claims, and that the skilled artisan would have no reason to combine *Viennese*, *Guenou*, and *Greenwald* to arrive at the present claims.

1. The Presently Claimed Methods and the Advantages of Same

Independent Claim 1 recites, in part, commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed generating foaming of the heated alimentary liquid. Independent Claim 26 recites, in part, heating the alimentary liquid comprising milk to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and stirring said liquid with stirring means at a second predetermined stirring speed ranging generating foaming of the heated alimentary liquid.

Because foam is a thermal insulator that could slow down the temperature increase of the liquid, it is thus important, when preparing beverages having a foam, to ensure that foam does not form before the alimentary liquid has reached the optimum foam forming temperature, for example, typically comprised between 60 °C and 70 °C in the case of milk. Appellants have found that simultaneously stirring and heating the alimentary liquid **comprising milk** at a speed, typically of the order of 500 to 1500 rpm, lower than a stirring speed necessary to generate foam in the alimentary liquid brings the entire volume of the heated alimentary liquid to the optimum foam forming temperature more quickly.

The second predetermined speed is at least twice, preferably three times higher than the first predetermined speed to generate foaming in the alimentary liquid. The first predetermined speed range is chosen so that a forced convection mode is carried out in the liquid that promotes a more rapid rise of temperature in the liquid but is still low enough to not form foam that would act as a thermal insulator. The second predetermined stirring speed range is selected so that the alimentary liquid that has substantially reached its optimum foam forming temperature level can be changed rapidly into a foam.

In an embodiment, the claimed methods can advantageously enable foam to be prepared quickly (i.e., within a few seconds only) from a determined quantity of the alimentary liquid using a mechanical stirring device of simple and economical construction that does not use steam. Thus, the claimed methods eliminate the drawbacks of the prior art devices with respect to the production of steam. Because the device for implementing the presently claimed methods can be made separately from a coffee machine, it is possible to prepare the coffee and the foam simultaneously. See, specification, page 3, lines 4-9.

Additionally, the method according to Claim 1 includes the use of a control and command means that may be used to advantageously control both the change of rotational direction of the rotating stirring means and the frequency of the changes. This is achieved by pre-programming a microcontroller with a program that is capable of running various stirring and heating programs depending on a desired container capacity. See, specification, page 4, line 36-page 5, line 12. Indeed, the specification states that "control means 24 comprise a microcontroller connected to motor 18 and to the heating element, and suitably programmed for controlling one or more foam producing cycles as a function of the quantity of liquid to be foamed." See, specification, page 7, lines 13-31.

For at least the reasons set forth below, Appellants respectfully submit that the cited references fail to disclose or suggest every element of the present claims, and that the skilled artisan would have no reason to combine the cited references to arrive at the present claims.

2. The Cited References Fail to Disclose or Suggest Each and Every Element of the Present Claims

Even if combinable, the cited references fail to disclose or suggest each and every element of independent Claims 1 and 26. *Viennese*, *Guenou* and *Greenwald,* alone or in combination, fail to disclose or suggest commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. *Viennese*, *Guenou* and *Greenwald,* alone or in combination, also fail to disclose or suggest commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed generating foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. *Viennese*, *Guenou* and *Greenwald,* alone or in combination, also fail to disclose or suggest heating the alimentary liquid comprising milk to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges in accordance with independent Claim 26.

Viennese discloses a method for making Viennese coffee by adding certain ingredients such as light cream and heavy cream during certain steps. See, *Viennese*. The Examiner even admits that *Viennese* fails to disclose or suggest heating an alimentary liquid comprising milk while stirring. See, Office Action, page 3, lines 1-3. In addition to failing to disclose or suggest heating an alimentary liquid comprising milk while stirring, *Viennese* also fails to disclose or suggest mechanically stirring at a first predetermined stirring speed and being insufficient to generate foaming of the heated alimentary liquid comprising milk, or mechanically stirring at a second predetermined stirring speed and generating foaming of the heated alimentary liquid comprising milk in accordance with independent Claims 1 and 26. For example, foaming milk is distinguishable from beating a cream.

Guenou discloses a food stirrer that uses controls to set the stirrer speed and the heating plate temperature. See, *Guenou*, Abstract. As shown by Figure 3, however, the "controls" of *Guenou* are manual controls that may be set by a user to control the stirrer speed and heating plate temperature. See, *Guenou*, Figure 3. At no place in the disclosure, however, does *Guenou* disclose or suggest any of heating the alimentary liquid comprising milk to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges, or commanding a device using control and command means in accordance with independent Claim 1. Further, at no place in the disclosure does *Guenou*

disclose or suggest any of heating the alimentary liquid comprising milk to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges in accordance with independent Claim 26.

Greenwald discloses using a controller to set a position of a valve to mix both hot and cold coffee to dispense a final coffee product at a desired and predetermined temperature. See, *Greenwald*, Abstract; page 6, paragraphs 76-90. At no place in the disclosure, however, does *Greenwald* disclose or suggest any of heating the alimentary liquid to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges, or commanding a device using control and command means in accordance with independent Claim 1. Further, at no place in the disclosure does *Greenwald* disclose or suggest any of heating the alimentary liquid to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges in accordance with independent Claim 26. Accordingly, Appellants respectfully submit that the presently cited references fail to teach or suggest each and every element of the present claims.

3. The Skilled Artisan Would Have No Reason to Combine the Cited References to Arrive at the Present Claims

Appellants also respectfully submit that the skilled artisan would have no reason to combine the cited references to arrive at the present claims in the absence of hindsight. As detailed above, independent Claims 1 and 26 are directed to methods of preparing foam from a milk-based liquid that enable form to be prepared quickly (i.e., within a few seconds only) from a determined quantity of liquid using a mechanical stirring device of simple and economical construction that does not use steam. Thus, the methods eliminate the drawbacks of the prior art devices with respect to the production of steam. Because the device for implementing the presently claimed methods can be made separately from a coffee machine, it is possible to prepare the coffee and the foam simultaneously. See, specification, page 3, lines 4-9. In contrast, *Viennese* merely discloses the steps and ingredients for producing *Viennese* coffee including light and heavy cream and does not even suggest specific devices or means for

producing the coffee, let alone specific temperatures, the stirring means or the first and second predetermined stirring speed ranges of the present claims.

Further, the controller of *Greenwald* is not even configured to control heating and stirring in accordance with Claim 1. While the controller of *Greenwald* may be used to maintain reservoirs at certain temperatures, the temperatures of those reservoirs do not change to mix the temperature-modified coffee. Instead, the controller simply controls a mixing valve to distribute a specific amount of coffee from the cold reservoir (T_c), and a specific amount of coffee from the hot reservoir (T_h). See, *Greenwald*, page 6, paragraphs 75-81. Likewise, *Greenwald* gives no indication that the coffee beverages are stirred, let alone changing the stirring speeds during operation. This is in direct contrast to the presently claimed control means that are able to change stirring speeds during operation. *Greenwald* fails to even recognize the advantages associated with the control means of the present claims.

Guenou simply discloses a standard mixer with no thought as to forming foam in an alimentary liquid comprising milk. *Guenou* is also entirely directed to a standard mixer, which teaches away from the present claims. For example, the specification expressly states that "the operation mode of [household appliances for stirring liquids] is too general and not adapted for generating a smooth, fine and hot milk foam in a very short period of time in order to prepare a drink such as a cappuccino. The use of these devices is also not very practical or very hygienic." See, specification, page 1, line 30-page 2, line 4. As such, *Guenou* teaches away from the present claims because standard mixers such as the mixer in *Guenou* are expressly disparaged in the specification as being "not very practical" and "not adapted" for generating the types of beverages that include a smooth, fine and hot milk foam. Appellants respectfully submit that the inventive leap required by the skilled artisan to modify *Viennese* with *Guenou* and *Greenwald* to arrive at the present claims is tenuous at best.

Further, Appellants also respectfully submit that, if the Patent Office could combine references to arrive at the present claims simply because each reference suggests an element of the present claims, then every invention would effectively be rendered obvious. For example, the mere fact that *Viennese* discloses stirring and beating ingredients, *Guenou* discloses a device for stirring and heating a mixture, and *Greenwald* discloses a controller for controlling the dispensing temperature of a coffee, does not mean that the recognition of a method involving providing controlling the heating and stirring speed using a specific control means and specific

first and second predetermined stirring speed ranges is necessarily *prima facie* obvious. Indeed, the controller of *Greenwald* is not even configured to control heating and stirring according to Claim 1, and the device of *Guenou* is simply a standard mixer.

In the final Office Action, the Examiner asserts that "[Appellant] makes several arguments against the references individually for lacking features they were not meant to stand alone addressing." See, Office Action, page 8, lines 4-5. In contrast, Appellants respectfully submit that, to the extent that the references are discussed individually, it is not to address the rejections as anticipation rejections under 35 U.S.C. §102(b), but rather to point out the deficiencies of the cited references. Accordingly, the cited references, even when taken as a whole, fail to recognize or even appreciate the advantages provided by the methods of the present claims, as discussed above.

Appellants respectfully submit that what the Examiner has done here is to apply hindsight reasoning by attempting to selectively piece together teachings of each of the references in an attempt to recreate what the claimed invention discloses. Appellants also submit that if it were proper for the Examiner to simply pick any claim element from any prior art reference to arrive at the present claims simply because the reference suggests the element, then every invention would effectively be rendered obvious. Instead, the skilled artisan must have a reason to combine the cited references to arrive at the present claims. Appellants respectfully submit that such a reason is not present in the instant case.

For at least the reasons set forth above, Appellants respectfully submit that the cited references fails to disclose or suggest each and every element of independent Claims 1 and 26. Moreover, the cited references fail to teach, suggest or even recognize the advantages and benefits of a method of preparing foam from a milk-based alimentary liquid for preparing a drink using a device according to Claims 1 and 26. As a result, independent Claims 1 and 26, along with any of the claims that depend from same, are novel and non-obvious over the cited references.

Accordingly, Appellants respectfully request that the obviousness rejection with respect to Claims 1-4 and 26 be reconsidered and withdrawn.

D. THE REJECTION OF CLAIMS 5-7 UNDER 35 U.S.C. §103(a) SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully request that the Board reverse the rejection of Claims 5-7 under 35 U.S.C. §103(a) because the Examiner has failed to establish a *prima facie* case of obviousness. In this regard, Appellants submit that the cited references fail to disclose or suggest each and every element of the present claims, and that the skilled artisan would have no reason to combine the cited references to arrive at the present claims.

Appellants respectfully submit that the patentability of Claim 1, as previously discussed, renders moot the obviousness rejection of Claims 5-7 that depend from Claim 1. More specifically, the cited references alone or in combination fail to disclose or suggest commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. The cited references, alone or in combination, also fail to disclose or suggest commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed ranging generating foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. In this regard, the cited references fail to teach or suggest the elements of Claims 5-7 in combination with the novel elements of Claim 1.

Accordingly, Appellants respectfully request that the obviousness rejection of Claims 5-7 be reconsidered and withdrawn.

E. THE REJECTION OF CLAIMS 8-10 AND 27-31 UNDER 35 U.S.C. §103(a) SHOULD BE REVERSED BECAUSE THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

Appellants respectfully request that the Board reverse the rejection of Claims 8-10 and 27-31 under 35 U.S.C. §103(a) because the Examiner has failed to establish a *prima facie* case of obviousness. In this regard, Appellants submit that the cited references fail to disclose or suggest

each and every element of the present claims, and that the skilled artisan would have no reason to combine the cited references to arrive at the present claims.

Appellants respectfully submit that the patentability of Claim 1 as previously discussed renders moot the obviousness rejection of Claims 8-10 that depend from Claim 1. More specifically, the cited references alone or in combination fail to disclose or suggest commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. The cited references, alone or in combination, also fail to disclose or suggest commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed ranging generating foaming of the heated alimentary liquid comprising milk as required by independent Claim 1. In this regard, the cited references fail to teach or suggest the elements of Claims 8-10 in combination with the novel elements of Claim 1.

Independent Claim 28 recites, in part, a method comprising commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid, and commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid. Independent Claim 30 recites, in part, a method comprising heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed ranging of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid, and stirring said liquid with stirring means at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid. Appellants respectfully submit that the cited references are deficient with respect to the present claims.

Viennese, *Guenou* and *Greenwald,* alone or in combination, fail to disclose or suggest each and every element of independent Claims 28 and 30. As discussed above, *Viennese*, *Guenou* and *Greenwald,* alone or in combination, fail to disclose or suggest commanding said driving means for said mechanical stirring means at a first predetermined stirring speed of up to

1500 rpm and being insufficient to generate foaming of the heated alimentary liquid comprising milk as required by independent Claim 28. *Viennese*, *Guenou* and *Greenwald,* alone or in combination, also fail to disclose or suggest commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid comprising milk as required by independent Claim 28. *Viennese*, *Guenou* and *Greenwald,* alone or in combination, also fail to disclose or suggest heating the alimentary liquid to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges in accordance with independent Claim 30.

Appellants further submit that *Frankel*, *Brown*, and *Langer* fail to remedy the deficiencies of *Viennese*, *Guenou* and *Greenwald* because *Frankel*, *Brown* and *Langer* also fail to disclose or suggest commanding said driving means for said mechanical stirring means at a first predetermined stirring speed of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid comprising milk as required by independent Claim 28. *Frankel*, *Brown* and *Langer* alone or in combination also fail to disclose or suggest commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid comprising milk as required by independent Claim 28. *Frankel*, *Brown* and *Langer* alone or in combination also fail to disclose or suggest heating the alimentary liquid to a predetermined temperature while stirring, or stirring a liquid using stirring means at the recited first or second predetermined stirring speed ranges in accordance with independent Claim 30.

Instead, *Frankel* is entirely directed to an apparatus to automatically heat and froth milk for beverages. See, *Frankel*, Abstract. To achieve frothed milk for beverages, a lower paddle of *Frankel* moves counter clockwise and an upper paddle moves clockwise. See, *Frankel*, column 3, line 55-column 4, line 2. However, both upper paddle group drive and lower paddle group drive of *Frankel* rotate at the same revolutions per minute. See, *Frankel*, column 7, lines 1-9. Indeed, *Frankel* fails to disclose alternating speeds, let alone first or second predetermined speeds. *Frankel* also fails to disclose or suggest heating the alimentary liquid to a predetermined temperature while stirring, a first speed insufficient to generate foaming of the liquid, or a second speed for generating foaming of the liquid.

Brown is entirely directed to a non-carbonated beverage dispenser having an in-bowl whipper assembly that includes a magnetically driven impeller. See, *Brown*, Abstract. Although *Brown* discloses the use of one speed (e.g., 4000 to 8000 rpm) to rotate the drive magnet, see, *Brown*, column 4, line 65-column 5, line 1, *Brown* fails to disclosure or suggest first or second predetermined speeds, heating the alimentary liquid to a predetermined temperature while stirring, a first speed insufficient to generate foaming of the liquid, or a second speed for generating foaming of the liquid.

Langer is entirely unrelated to the subject matter of the present claims and is entirely directed to dietary fiber supplements in beverage and liquid concentrate liquid dosage forms wherein the dietary fiber source is cellulose ether. See, *Langer*, Abstract. Although *Langer* discloses the use of a stirring speed of 200 to 1000 rpm, see, *Langer*, column 3, lines 23-29, *Langer* fails to disclosure or suggest first or second predetermined speeds, heating the alimentary liquid to a predetermined temperature while stirring, a first speed insufficient to generate foaming of the liquid, or a second speed for generating foaming of the liquid.

Appellants also respectfully submit that the skilled artisan would have no reason to combine *Viennese*, *Guenou*, *Greenwald*, *Frankel*, *Brown* and *Langer* because the cited references are directed to unrelated products that have completely different objectives. For example, *Viennese* discloses a method for making Viennese coffee by adding certain ingredients such as light cream and heavy cream during certain steps. See *Viennese*. *Guenou* discloses a food stirrer that uses controls to set the stirrer speed and the heating plate temperature. See *Guenou*, Abstract. *Greenwald* discloses using a controller to set a position of a valve to mix both hot and cold coffee to dispense a final coffee product at a desired and predetermined temperature. See, *Greenwald*, Abstract; page 6, paragraphs 76-90. *Frankel* is entirely directed to an apparatus to automatically heat and froth milk for beverages. See, *Frankel*, Abstract. *Brown* is entirely directed to a non-carbonated beverage dispenser having an in-bowl whipper assembly that includes a magnetically driven impeller. See, *Brown*, Abstract. *Langer* is entirely directed to dietary fiber supplements in beverage and liquid concentrate liquid dosage forms wherein the dietary fiber source is cellulose ether. See, *Langer*, Abstract. As such, the cited references are directed to unrelated products that have completely different objectives.

Additionally, as mentioned above, Appellants submit that if the Examiner could combine references to arrive at the present claims simply because each reference suggests an element of

the present claims then every invention would effectively be rendered obvious. For example, the mere fact that *Viennese* discloses stirring and beating ingredients, *Guenou* discloses a device for stirring and heating a mixture, and *Greenwald* discloses a controller for controlling the dispensing temperature of a coffee, does not mean that the recognition of a method involving providing controlling the heating and stirring speed using a specific control means and specific first and second predetermined stirring speed ranges is necessarily *prima facie* obvious. Indeed, the controller of *Greenwald* is not even configured to control heating and stirring according to Claim 1, the device of *Guenou* is simply a standard mixer, and the cellulose ether dietary fiber supplements of *Langer* are not even remotely related to the presently claimed methods for preparing foam from a milk-based alimentary liquid.

Appellants respectfully submit that it is only with a hindsight reconstruction of Appellants' claimed invention that the Patent Office is able to even attempt to piece together the teachings of the prior art so that the claimed invention is allegedly rendered obvious. However, the claims must be viewed as a whole as defined by the claimed invention and not dissected into discrete elements to be analyzed in isolation. *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983); *In re Ochiai*, 71 F.3d 1565, 1572, 37 USPQ2d 1127, 1133 (Fed. Cir. 1995). One should not use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d at 1075. (Fed. Cir. 1988). Therefore, for at least the above-mentioned reasons, Appellants respectfully submit that the cited references are deficient with respect to the present claims.

Accordingly, Appellants respectfully request that the obviousness rejections of Claims 8-10 and 27-31 be reconsidered and withdrawn.

VIII. CONCLUSION

Appellants respectfully submit that the Examiner has failed to establish obviousness under 35 U.S.C. §103 with respect to the present claims. Accordingly, Appellants respectfully submit that the obviousness rejections are erroneous in law and in fact and should, therefore, be reversed by this Board.

The Director is authorized to charge $620 for the Appeal Brief and any additional fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 3712036-00751 on the account statement.

Respectfully submitted,

K&L GATES LLP

BY _____

Robert M. Barrett
Reg. No. 30,142
Customer No. 29157
Phone No. 312-807-4204

Dated: October 10, 2011

CLAIMS APPENDIX
PENDING CLAIMS ON APPEAL OF
U.S. PATENT APPLICATION SERIAL NO. 10/598,669

1. A method of preparing foam from a milk-based alimentary liquid for preparing a drink using a device comprising a frame including a support for a container, said support being associated with heating means for heating said alimentary liquid contained in said container when the container is disposed on said support, mechanical stirring means extending at least partially into said container, means for driving said stirring means, and control and command means arranged for automatically controlling the command of said heating means and said drive means, said method comprising:

a) placing a quantity of alimentary liquid comprising milk in the container associated with said stirring means;

b) commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and

c) commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed generating foaming of the heated alimentary liquid.

2. The method according to claim 1, wherein the control and command means are arranged so as to maintain said quantity of liquid at a desired temperature during step c).

3. The method according to claim 1, wherein the control and command means are arranged so as to adapt the quantity of heating energy supplied during step b) as a function of said quantity of liquid.

4. The method according to claim 3, wherein the adaptation by the control and command means of the quantity of heating energy supplied is achieved by adjusting at least one of the heating power and the heating time.

5. The method according to claim 1, wherein during step c) the control and command means drive the stirring means in a discontinuous manner.

6. The method according to claim 5, wherein the control and command means are arranged so as to drive the stirring means with a stirring interruption frequency ranging from approximately 0.3 to 0.5 Hz.

7. The method according to claim 5, wherein said stirring means comprise a rotating stirring element, the control and command means drive said rotating stirring element so that it changes rotational direction after each interruption.

8. The method according to claim 1, wherein said second predetermined stirring speed is at least twice, said first predetermined stirring speed.

9. The method according to of claim 8, wherein the stirring means comprises a rotating stirring element, the first predetermined stirring speed ranging between 500 and 1500 rpm.

10. The method according to claim 8, wherein the stirring means comprises a rotating stirring element, said second predetermined stirring speed ranging between 3000 and 10000 rpm.

26. A method of preparing foam from a milk-based liquid for preparing a drink, the method comprising :

a) placing a quantity of alimentary liquid comprising milk in a container having a stirrer;

b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed being insufficient to generate foaming of the heated alimentary liquid; and

c) stirring said liquid with stirring means at a second predetermined stirring speed generating foaming of the heated alimentary liquid.

27. The method of Claim 26, wherein the first predetermined stirring speed ranges between 500 and 1500 rpm and the second predetermined stirring speed ranges between 3000 and 10000 rpm.

28. A method of preparing foam from a milk-based alimentary liquid for preparing a drink using a device comprising a frame including a support for a container, said support being associated with heating means for heating said alimentary liquid contained in said container when the container is disposed on said support, mechanical stirring means extending at least partially into said container, means for driving said stirring means, and control and command means arranged for automatically controlling the command of said heating means and said drive means, said method comprising:

a) placing a quantity of alimentary liquid in the container associated with said stirring means;

b) commanding, via the control and command means, said heating means associated with said support to heat said quantity of alimentary liquid to a predetermined temperature while commanding said driving means for said mechanical stirring means at a first predetermined stirring speed of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid; and

c) commanding, via the control and command means said mechanical stirring means for stirring said quantity of liquid at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid.

29. The method of Claim 28, wherein the first predetermined stirring speed ranges between 500 and 1500 rpm and the second predetermined stirring speed ranges between 3000 and 10000 rpm.

30. A method of preparing foam from a milk-based liquid for preparing a drink, the method comprising:

a) placing a quantity of alimentary liquid in a container having a stirrer;

b) heating the alimentary liquid to a predetermined temperature while stirring the liquid with stirring means at a first predetermined stirring speed ranging of up to 1500 rpm and being insufficient to generate foaming of the heated alimentary liquid; and

c) stirring said liquid with stirring means at a second predetermined stirring speed of at least 3000 rpm and generating foaming of the heated alimentary liquid.

31. The method of Claim 30, wherein the first predetermined stirring speed ranges between 500 and 1500 rpm and the second predetermined stirring speed ranges between 3000 and 10000 rpm.

EVIDENCE APPENDIX

EXHIBIT A: Non-final Office Action dated May 25, 2011

EXHIBIT B: Final Office Action dated August 25, 2011

EXHIBIT C: "Viennese (hot) 4 servings," ("*Viennese*")

EXHIBIT D: German Patent No. DE 10223444 to Guenou ("*Guenou*")

EXHIBIT E: U.S. Publ. No. 2002/0130137 to Greenwald et al. ("*Greenwald*")

EXHIBIT F: U.S. Patent No. 6,283,625 to Frankel et al. ("*Frankel*")

EXHIBIT G: U.S. Patent No. 4,537,332 to Brown et al. ("*Brown*")

EXHIBIT H: U.S. Patent No. 5,374,444 to Langer ("*Langer*")

RELATED PROCEEDINGS APPENDIX

None.

EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/598,669	06/19/2007	Christophe Boussemart	3712036-00751	8693

29157 7590 05/25/2011

K&L Gates LLP
P.O. Box 1135
CHICAGO, IL 60690

EXAMINER	
SMITH, PRESTON	
ART UNIT	PAPER NUMBER
1782	

NOTIFICATION DATE	DELIVERY MODE
05/25/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

chicago.patents@klgates.com

Office Action Summary	Application No.	Applicant(s)	
	10/598,669	BOUSSEMART ET AL.	
	Examiner	Art Unit	
	PRESTON SMITH	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 26-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 26-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/28/2011 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-4 and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see

DE10223444abstract and the translation of DE10223444) and Shlomo Greenwald, US-PGPub 2002/0130137.

Regarding claims 1 and 26, Viennese NPL teaches a recipe for making hot Viennese melting chocolate in a sauce pan, stirring in light cream, slowly adding coffee, and beating until frothy. “Stirring” is considered to be the 1st predetermined speed and “beating” is considered to be the second predetermined speed since “beating” is faster than “stirring”. The froth or foam is formed at the second "predetermined speed".

Viennese NPL fails to teach heating while stirring and the automated apparatus that is capable of performing manual process of Viennese with the claimed features. Viennese NPL also fails to teach the composition comprising milk.

Guenou teaches that electronic devices with a "frame”, “support”, and “container" that are capable of stirring at different speeds while heating are well known in the art (see Fig 2 and DE1022344abstract). It would have been obvious to one of ordinary skill to use such a device as Guenou to carry out the manual process of Viennese since machines are more favorable than manually carrying out a process since machines eliminate the need for physical exertion and save time. Additionally, it has been held that providing a mechanical or automatic means to replace manual activity which has accomplished the same result involves only routine skill in the art.

Referring to a command and control means arrange for automatically controlling heating and “driving”, controls that automatically control mixing and temperature are well known in the art and further, Greenwald teaches that control systems that

automatically regulate temperature and stirring for beverage systems are well known in the art (see 0075 and 0076.) It would have been obvious to one of ordinary skill to further combine this feature with the invention of Viennese in view of Guenou since this would eliminate the need for one of ordinary skill to constantly regulate these features and make producing beverages easier.

Referring to heating while stirring, it would however have been obvious to heat while stirring since the overall beverage is desired to be hot and heating throughout the entire process would help maintain the beverage composition in a heated state. Additionally, heating while carrying out the processing steps would ensure that the melted chocolate doesn't solidify at a later stage and would make it easier to mix the components such as cream and chocolate since these components mix easier in a heated state.

Referring to a composition comprising milk, the NPL reference uses melted chocolate however does not describe what the chocolate is. Most chocolates contain milk and milk chocolate is a very desirable chocolate due to its taste, texture, etc. Milk chocolate is commonly added to all kinds of beverages including coffees (for example, Starbucks commonly adds milk chocolate ingredients into coffee that is commonly prepared for consumers such as mochas). It would have for one of ordinary skill to use a common chocolate such as milk chocolate as the specific chocolate since milk chocolate is tasty and has highly desirable properties. Thus the limitation of a composition comprising milk would have been obvious.

Regarding claim 2, when the heating is set on a particular setting, the temperature of a liquid inside of the container will be "maintained".

Regarding claims 3-4, it would have been obvious to adjust heating setting and adjust the amount of heat supplied or the time of heating in response to the amount of liquid added since less heating will be required for less liquid and more heating would be required for more liquid to reach a desired temperature.

Claims 5-7 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see DE10223444abstract and the translation of DE10223444) , Shlomo Greenwald, US-PGPub 2002/0130137, and Stephen W. Frankel, US-Patent 6,283,625

Regarding claims 5 and 7, the references teach the invention of claim 1 however the references fail to further teach discontinuous stirring. Frankel teaches stirring wherein the impellers reverse direction after 10-40 seconds (or 0.025-0.1 Hz) (see column 5, lines 60 - 67 and column 6, lines 1-10). It would have been obvious to carry out stirring in a similar manner with the composite invention discussed previously since this would reduce the build up of ingredients at the sides of the container due to centrifugal force and would reduce the probability of the contents coming out the side of the bowl.

Regarding claim 6, in the modification of the stirring of the composite invention further in view of Frankel, one of ordinary skill would have found applicant's claimed range obvious and discoverable through routine experimentation in light of the references. The effect of centrifugal force would be related to the viscosity of the beverage and the distribution of the materials in the beverage and from physical observation, one of ordinary skill would be able to determine the time it takes for the substances to accumulate on the sides of the bowl and would thus know to adjust the frequency in response.

Claims 8-10 and 27-31 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see DE10223444abstract and the translation of DE10223444), Shlomo Greenwald, US-PGPub 2002/0130137, Stephen W. Frankel, US-Patent 6,283,625, Merle S. Brown, US-Patent 4,537,332, and Bruce, Langer, US-Patent 5,374,444.

Regarding claims 8-10, the references teach the invention of claim 1 however the speeds at the different stages are not known.

Brown teaches that whipping (or beating) beverages is commonly performed at 4000 rpm or more in the art (column 2, line 14). Langer teaches that stirring beverages is commonly done at 200-1000 rpm (column 14, line 3). It would have been obvious to one of ordinary skill to look to these references for common mixing and beating speeds to carry out the composite invention.

Regarding claims 27-31, these limitations would have been obvious for reasons mentioned previously.

Response to Arguments

Applicant's arguments filed 04/28/2011have been fully considered but they are not persuasive.

Applicant argues that foaming milk is distinguishable from beating cream and thus the claim distinguishes over the references (see page 8, 2nd paragraph). The claim as present claims a composition comprising milk or a milk based liquid. It appears that as long as the beverage has milk from some source inside of it, it would meet the claim limitation.

Applicant also argues on the 1st paragraph of page 9 that Greenwald is directed to using a controller to set a position of a valve to mix both hot and cold coffee to dispense a final coffee product and doesn't teach heating the liquid, stirring while heating, stirring with a stirring means, and a command and control device. Greenwald teaches that control systems that automatically regulate temperature and stirring for beverage systems are well known in the art (see 0075 and 0076.) It would have been obvious to one of ordinary skill to further combine this feature with the invention of Viennese in view of Guenou since this would eliminate the need for one of ordinary skill to constantly regulate these features and make producing beverages easier.

Applicant argues that examiner used hindsight to piece together the references to arrive at the claimed invention (see page 10). It must be recognized that any

judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant continues to argue previous points for the remaining pages however these arguments are not persuasive for reasons previously mentioned.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PRESTON SMITH whose telephone number is (571)270-7084. The examiner can normally be reached on Mon-Th 6:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on (571)272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Drew E Becker/
Primary Examiner, Art Unit 1782

prs

EXHIBIT B

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/598,669	06/19/2007	Christophe Boussemart	3712036-00751	8693

29157 7590 08/25/2011

K&L Gates LLP
P.O. Box 1135
CHICAGO, IL 60690

EXAMINER	
SMITH, PRESTON	
ART UNIT	PAPER NUMBER
1782	

NOTIFICATION DATE	DELIVERY MODE
08/25/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

chicago.patents@klgates.com

Office Action Summary	Application No.	Applicant(s)	
	10/598,669	BOUSSEMART ET AL.	
	Examiner	Art Unit	
	PRESTON SMITH	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2011*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-10 and 26-31* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-10 and 26-31* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-4 and 26 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see DE10223444abstract and the translation of DE10223444) and Shlomo Greenwald, US-PGPub 2002/0130137.

Regarding claims 1 and 26, Viennese NPL teaches a recipe for making hot Viennese melting chocolate in a sauce pan, stirring in light cream, slowly adding coffee, and beating until frothy. “Stirring” is considered to be the 1st predetermined speed and “beating” is considered to be the second predetermined speed since “beating” is faster than “stirring”. The froth or foam is formed at the second "predetermined speed".

Viennese NPL fails to teach heating while stirring and the automated apparatus that is capable of performing manual process of Viennese with the claimed features. Viennese NPL also fails to teach the composition comprising milk.

Guenou teaches that electronic devices with a "frame", “support”, and “container" that are capable of stirring at different speeds while heating are well known in the art (see Fig 2 and DE1022344abstract). It would have been obvious to one of ordinary skill to use such a device as Guenou to carry out the manual process of Viennese since machines are more favorable than manually carrying out a process since machines eliminate the need for physical exertion and save time. Additionally, it has been held that providing a mechanical or automatic means to replace manual activity which has accomplished the same result involves only routine skill in the art.

Referring to a command and control means arrange for automatically controlling heating and “driving”, controls that automatically control mixing and temperature are well known in the art and further, Greenwald teaches that control systems that automatically regulate temperature and stirring for beverage systems are well known in the art (see 0075 and 0076.) It would have been obvious to one of ordinary skill to further combine this feature with the invention of Viennese in view of Guenou since this would eliminate the need for one of ordinary skill to constantly regulate these features and make producing beverages easier.

Referring to heating while stirring, it would however have been obvious to heat while stirring since the overall beverage is desired to be hot and heating throughout the entire process would help maintain the beverage composition in a heated state.

Additionally, heating while carrying out the processing steps would ensure that the melted chocolate doesn't solidify at a later stage and would make it easier to mix the components such as cream and chocolate since these components mix easier in a heated state.

Referring to a composition comprising milk, the NPL reference uses melted chocolate however does not describe what the chocolate is. Most chocolates contain milk and milk chocolate is a very desirable chocolate due to its taste, texture, etc. Milk chocolate is commonly added to all kinds of beverages including coffees (for example, Starbucks commonly adds milk chocolate ingredients into coffee that is commonly prepared for consumers such as mochas). It would have for one of ordinary skill to use a common chocolate such as milk chocolate as the specific chocolate since milk chocolate is tasty and has highly desirable properties. Thus the limitation of a composition comprising milk would have been obvious.

Regarding claim 2, when the heating is set on a particular setting, the temperature of a liquid inside of the container will be "maintained".

Regarding claims 3-4, it would have been obvious to adjust heating setting and adjust the amount of heat supplied or the time of heating in response to the amount of liquid added since less heating will be required for less liquid and more heating would be required for more liquid to reach a desired temperature.

Claims 5-7 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see DE10223444abstract and the translation of DE10223444) , Shlomo Greenwald, US-PGPub 2002/0130137, and Stephen W. Frankel, US-Patent 6,283,625

Regarding claims 5 and 7, the references teach the invention of claim 1 however the references fail to further teach discontinuous stirring. Frankel teaches stirring wherein the impellers reverse direction after 10-40 seconds (or 0.025-0.1 Hz) (see column 5, lines 60 - 67 and column 6, lines 1-10). It would have been obvious to carry out stirring in a similar manner with the composite invention discussed previously since this would reduce the build up of ingredients at the sides of the container due to centrifugal force and would reduce the probability of the contents coming out the side of the bowl.

Regarding claim 6, in the modification of the stirring of the composite invention further in view of Frankel, one of ordinary skill would have found applicant's claimed range obvious and discoverable through routine experimentation in light of the references. The effect of centrifugal force would be related to the viscosity of the beverage and the distribution of the materials in the beverage and from physical observation, one of ordinary skill would be able to determine the time it takes for the substances to accumulate on the sides of the bowl and would thus know to adjust the frequency in response.

Claims 8-10 and 27-31 rejected under 35 U.S.C. 103(a) as being unpatentable over Viennese NPL in view of K, Guenou, DE 10223444 (also see DE10223444abstract and the translation of DE10223444), Shlomo Greenwald, US-PGPub 2002/0130137, Stephen W. Frankel, US-Patent 6,283,625, Merle S. Brown, US-Patent 4,537,332, and Bruce, Langer, US-Patent 5,374,444.

Regarding claims 8-10, the references teach the invention of claim 1 however the speeds at the different stages are not known.

Brown teaches that whipping (or beating) beverages is commonly performed at 4000 rpm or more in the art (column 2, line 14). Langer teaches that stirring beverages is commonly done at 200-1000 rpm (column 14, line 3). It would have been obvious to one of ordinary skill to look to these references for common mixing and beating speeds to carry out the composite invention.

Regarding claims 27-31, these limitations would have been obvious for reasons mentioned previously.

Response to Arguments

Applicant's arguments filed 08/08/2011 have been fully considered but they are not persuasive.

Applicant argues that the references fail to teach stirring at a first speed insufficient to generate foam and a second speed to generate foam (see bottom of page

3 and first two paragraphs of page 4). Applicant further states that foaming milk is different from beating cream. Vienesse NPL discloses the two speeds wherein froth is created at the second. The claim does not require the liquid to just be milk wherein foam only comes from the milk and nothing else. The claim requires "foaming of the liquid". The claim does not exclude liquids that have other components that generate the foam.

Applicant argues that Guenou and Greenwald do not disclose the stirring limitations (see last paragraph of page 4 and first of page 5). These references were not meant to stand alone and were meant to be viewed in combination with Vienesse. In combination, the references show that the claim limitations are obvious.

Applicant also argues on the page 5, 2nd pargraph that Greenwald is is not configured to stir and heat according to claim 1. Greenwald teaches that control systems that automatically regulate temperature and stirring for beverage systems are well known in the art (see 0075 and 0076.) It would have been obvious to one of ordinary skill to further combine this feature with the invention of Viennese in view of Guenou since this would eliminate the need for one of ordinary skill to constantly regulate these features and make producing beverages easier.

Applicant argues that one of ordinary skill would have no reason to modify the reference in the absence of hindsight (page 5, 2nd paragraph. Also see page 6-7). It must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed

invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant makes several arguments against the references individually for lacking features they were not meant to stand alone addressing. (see pages 7-10.) One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues that examiner used hindsight to piece together the references to arrive at the claimed invention (see page 10). It must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PRESTON SMITH whose telephone number is (571)270-7084. The examiner can normally be reached on Mon-Th 6:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on (571)272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Drew E Becker/
Primary Examiner, Art Unit 1782

prs

EXHIBIT C

Viennese (hot) 4 servings

1/2 cup chocolate
2 1/2 cups strong coffee
4 tablespoons light cream
2/3 cup heavy cream
1 teaspoon sugar
dash of cinnamon
dash of cocoa

1. Melt chocolate in sauce pan
2. Stir in light cream
3. Slowly add coffee, beating until frothy
4. In a cold bowl whip heavy cream and sugar
5. Pour coffee mixture into cups
6. Top off with heavy cream
   Garnish with sprinkle of cinnamon and cocoa

EXHIBIT D

DERWENT-ACC-NO: 2004-192492

DERWENT-WEEK: 200419

TITLE: Stirring bowl is of metal, with a heated plate, to prepare foodstuffs and meals by heat and stirring with less physical effort

PATENT-ASSIGNEE: GUENOU K[GUENI]

PRIORITY-DATA: 2002DE-1023444 (May 23, 2002)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
DE **10223444** A1	December 4, 2003	DE

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
DE 10223444A1	N/A	2002DE-1023444	May 23, 2002

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	A47 J 43/044 20060101
CIPS	H05 B 3/68 20060101

ABSTRACTED-PUB-NO: DE **10223444** A1

BASIC-ABSTRACT:

NOVELTY - The food stirrer has a bowl with a heated plate, to heat the contents during stirring. The bowl is of metal for heat transfer from the heating plate. The foot of the bowl is anchored to a suitable surface, and controls set the stirrer speed and the heating plate temperature.

USE - The heated stirring bowl is for the preparation of jam and marmalade, burned almonds, corn dough, fruit and vegetable purees, etc.

ADVANTAGE - The stirring bowl heats and cooks the contents during stirring to give prepared foodstuffs and meals with less physical effort.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic plan view of the stirring bowl assembly. (The drawing includes non-English language text).

EQUIVALENT-ABSTRACTS:

METALLURGY

The bowl can be of steel or aluminum.

CHOSEN-DRAWING: Dwg.1/5

TITLE-TERMS: STIR BOWL METAL HEAT PLATE PREPARATION FOOD MEAL LESS PHYSICAL EFFORT

DERWENT-CLASS: P28 X25 X27

EPI-CODES: X25-B01C1B; X27-C02;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 2004-152715

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENT- UND MARKENAMT

(12) **Offenlegungsschrift**

(10) **DE 102 23 444 A 1**

(51) Int. Cl.[7]:
A 47 J 43/07
A 47 J 27/00
H 05 B 3/68

(21) Aktenzeichen: 102 23 444.2
(22) Anmeldetag: 23. 5. 2002
(43) Offenlegungstag: 4. 12. 2003

(71) Anmelder:
Guenou, Kwami, 48341 Altenberge, DE

(72) Erfinder:
Erfinder wird später genannt werden

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Rührgerät mit Heizplatte

DE 102 23 444 A 1

DE 102 23 444 A 1

Beschreibung

[0001] Dieses Gerät ist unter dem klassischen Namen "Rührgerät" bereits bekannt. Diese neue Version des Rührgeräts besitzt die gleiche Herstellungs- und Gebrauchstechnik. Das Einzige, was man dem klassischen Rührgerät hinzugefügt hat, ist die Heizplatte die dort eingebaut wurde wo man die Schüssel abstellt.

[0002] Um der Hitze zu widerstehen, wird die Schüssel des neuen Rührgeräts aus Stahl oder aus Aluminium sein. Außerdem wird es eine Vorrichtung am Fuß geben, um sie während des Gebrauchs fest verankern zu können.

[0003] Mit der Heizplatte kann diese Rührschüssel nicht nur warm rühren, sondern erlaubt es einem ohne Schwierigkeiten Gerichte vorzubereiten, die sonst während des Kochens unter Einsatz körperlicher Kraft gerührt werden müssen.

- Marmelade
- Gebrannte Mandeln
- Maisteig
  Yampurree
- Kartoffelpurree, etc.

[0004] Um den Hitzegrad zu regulieren gibt es einen zweiten Regulatorknopf neben dem Ersten, der die Geschwindigkeit des Rührens regelt.

Patentansprüche

In den letzten 50 Jahren haben die Menschen aus verschiedenen Ländern angefangen zusammen zu kommen, sich besser kennen zu lernen. So haben wir z. B. die schwarzen Europäer, die weißen Afrikaner, usw. . . . Wenn wir das Kind von Eltern zweier verschiedenen Nationalitäten vor Augen nehmen, so ist dieses das Symbol der Verschmelzung zweier Kulturen.

So schnell wie die Menschen sich bewegen, zusammen kommen, so schnell bewegen sich auch ihre verschiedenen Kulturen; sie verschmelzen. Aus dieser Verschmelzung wird eine neue "Zwischenkultur" geboren, die normalerweise biegsamer, offener, praktischer ist. Genauso verhält es sich mit der neuen Generation der Rührschüssel mit Heizplatte. Sie ist das Ergebnis zweier Kulturen: Kulinarische europäische Kultur und die anderer Weltregionen.

Mit der Rührschüssel mit Heizplatte macht die Zubereitung von:

- gebrannten Mandel, die in Europa geschätzt werden, keine Probleme mehr
- der traditionellen Hausmannsmarmelade, keine Probleme mehr
- Maisteig, der in Afrika geschätzt wird, keine Probleme mehr
- Griesteig
- Yamteig
- und sonstige kulinarischen Vorbereitungen die gerührt werden müssen, oder die sonst während des Kochens körperliche Anstrengungen erfordern, machen keine Probleme mehr

Die Rührschüssel mit Heizplatte ist das Ergebnis mehrerer verschiedener Kulturen, aus Europa und anderen Weltregionen.

Ich hoffe sehr dass die Zubereitung vieler Gerichte dadurch vereinfacht wird, und uns so das Leben schöner und angenehmer machen wird.

Hierzu 5 Seite(n) Zeichnungen

- Leerseite -

Nummer: DE 102 23 444 A1
Int. Cl.[7]: A 47 J 43/07
Offenlegungstag: 4. Dezember 2003

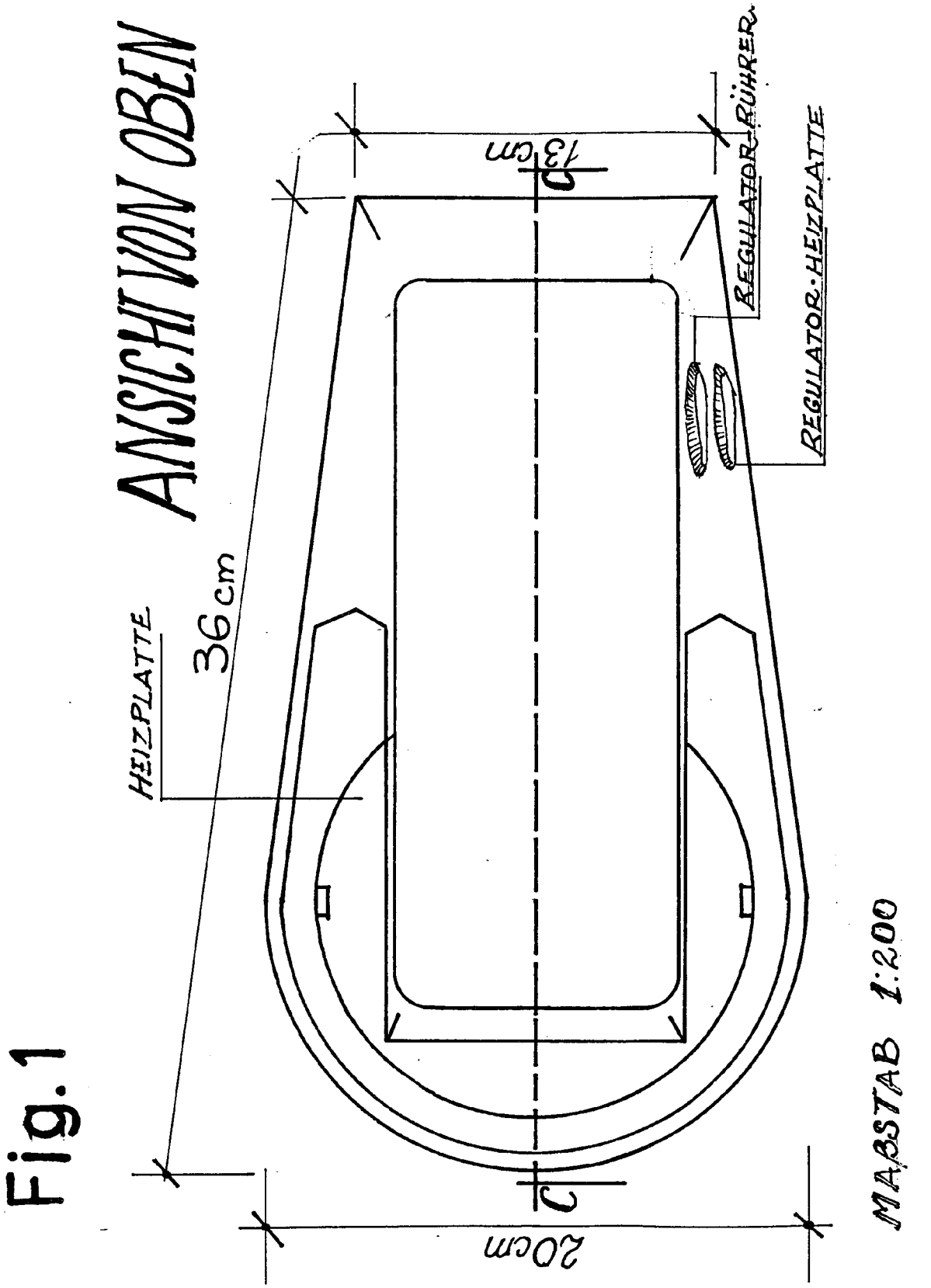

Fig. 1

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Int. Cl.[7]: A 47 J 43/07
Offenlegungstag: 4. Dezember 2003

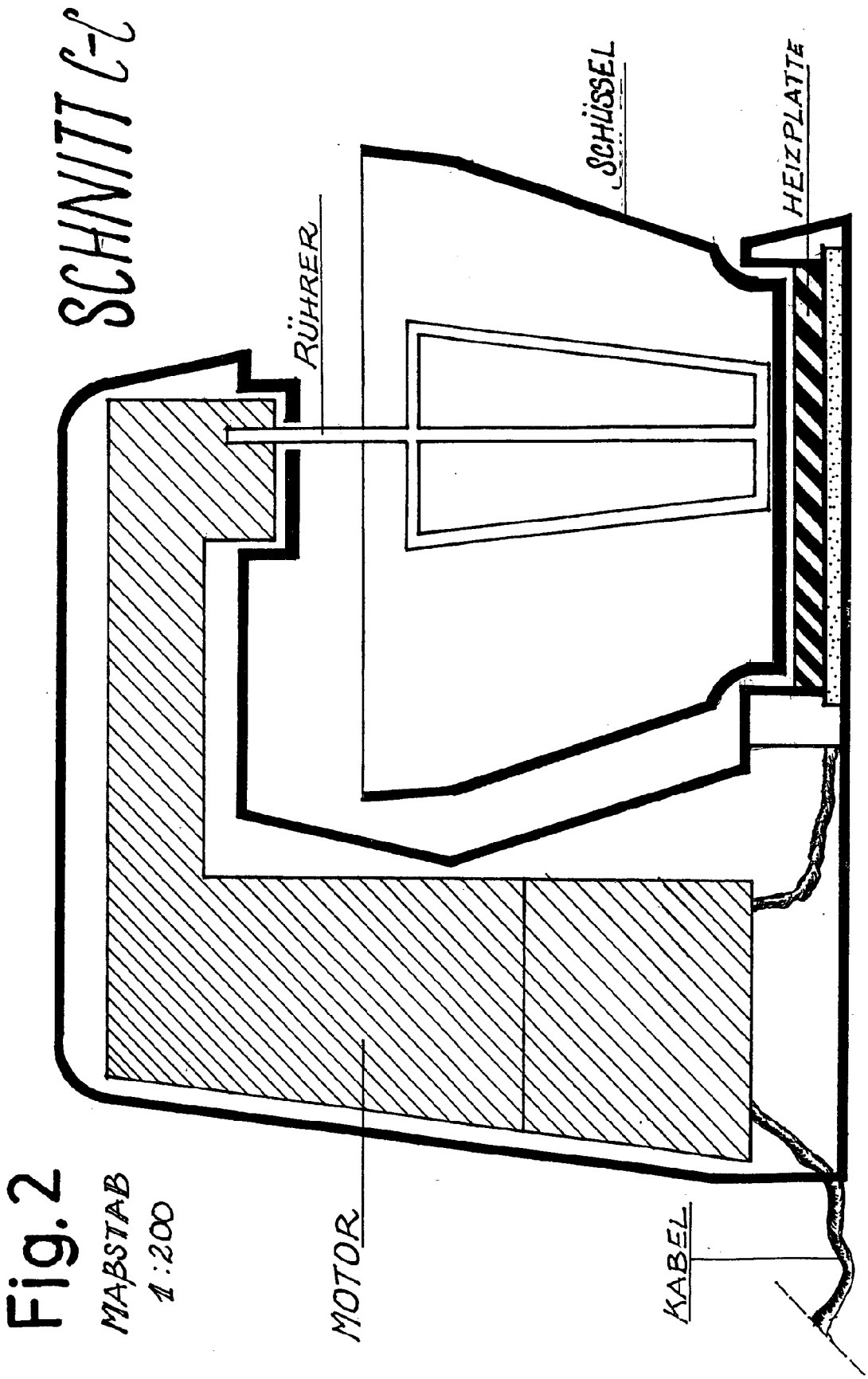

Fig. 2

103 490/584

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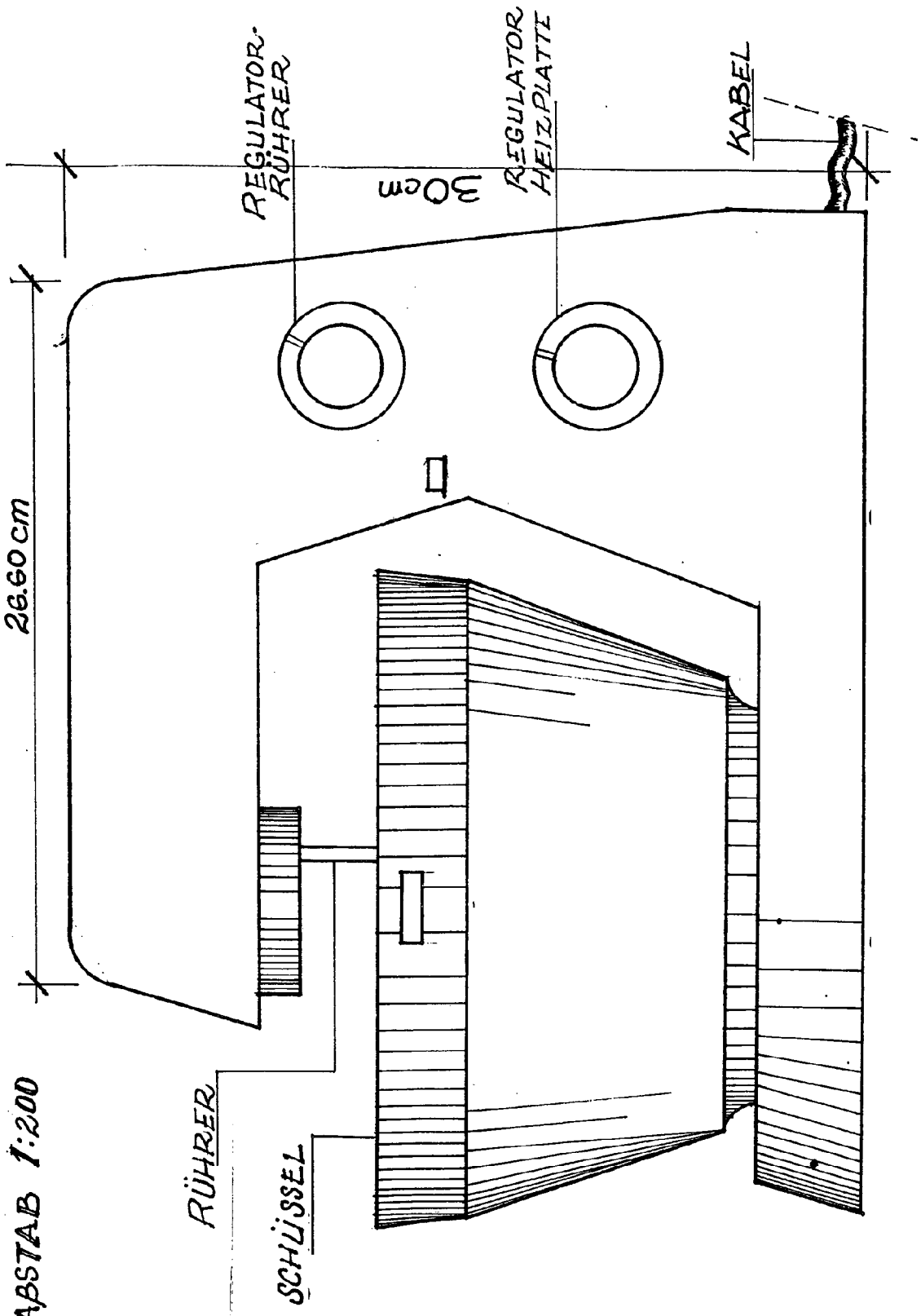

Fig. 3
MAßSTAB 1:200

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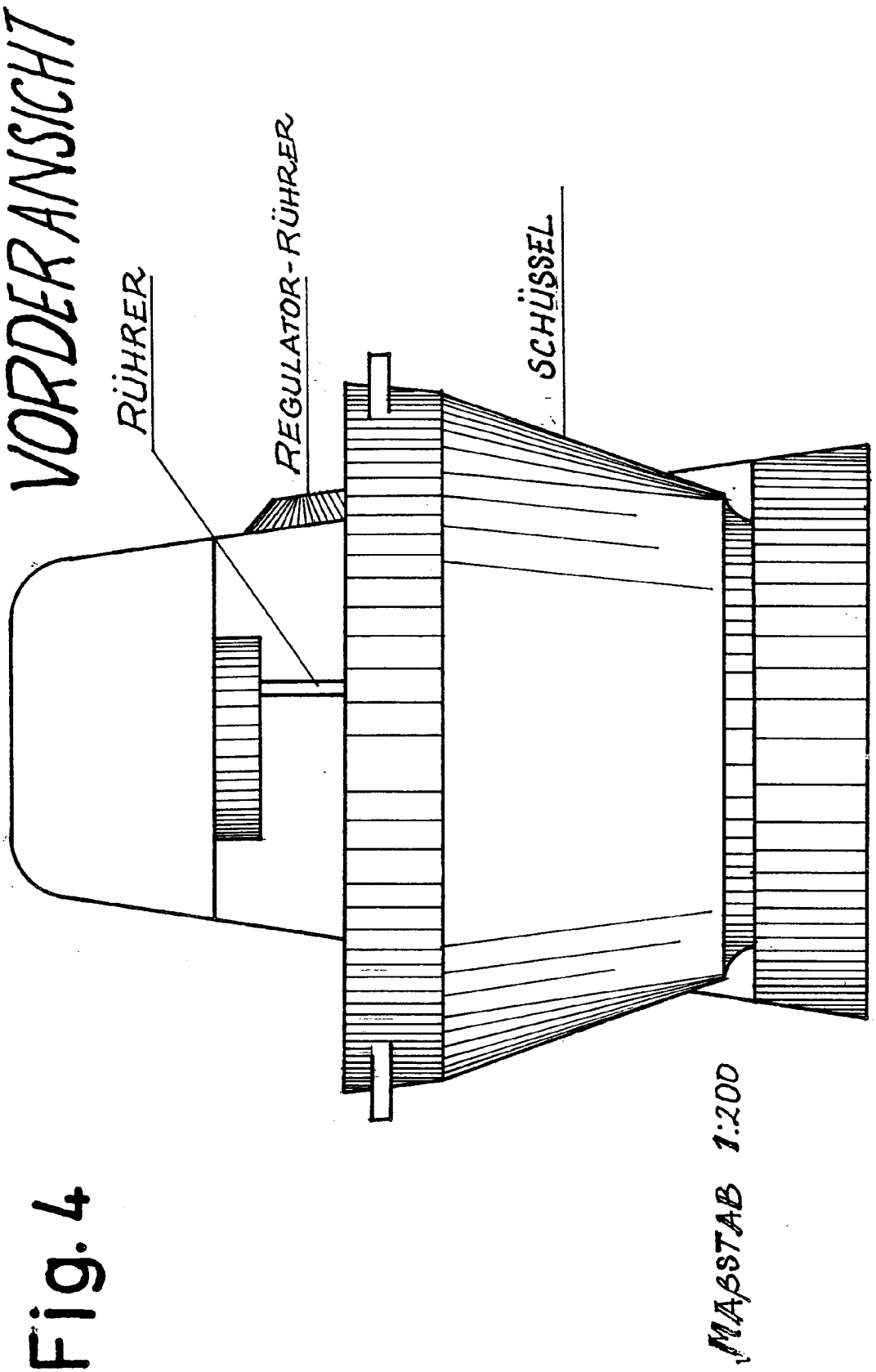

Fig. 4

Nummer: DE 102 23 444 A1
Int. Cl.[7]: A 47 J 43/07
Offenlegungstag: 4. Dezember 2003

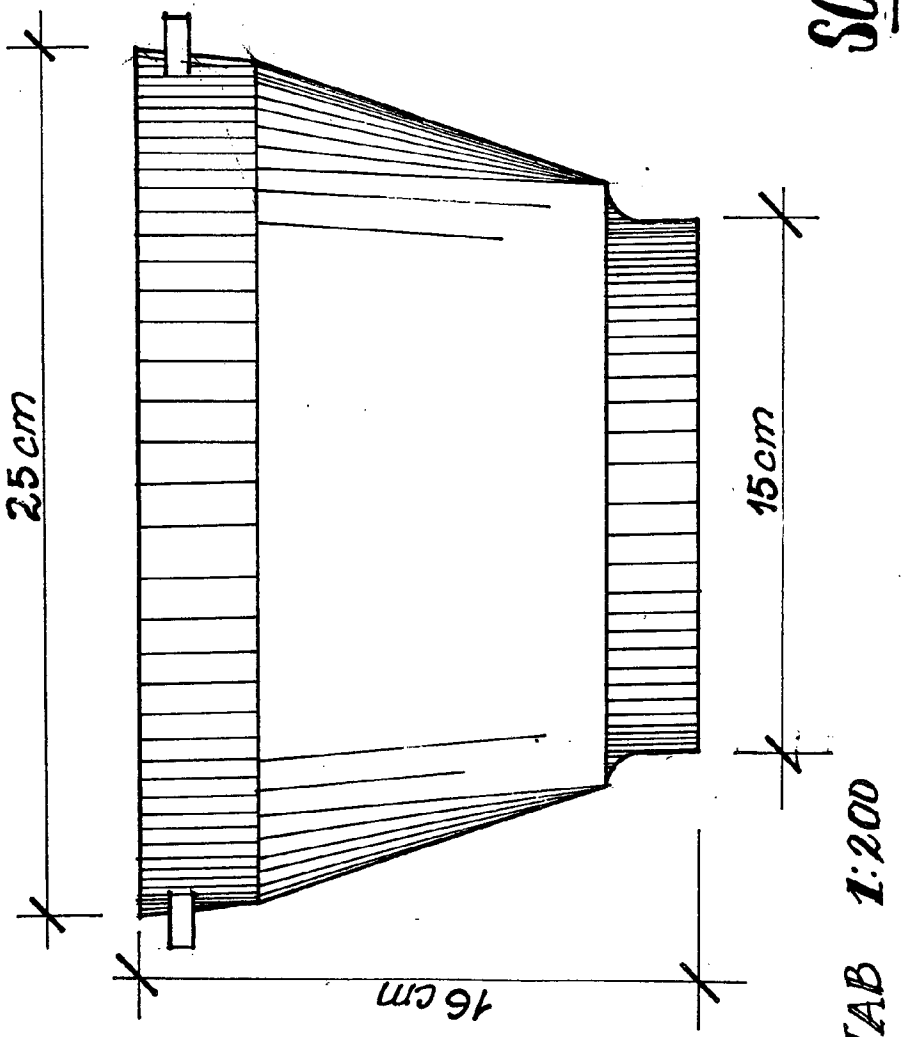

Fig. 5

EXHIBIT E

US 20020130137A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2002/0130137 A1

Greenwald et al. (43) Pub. Date: Sep. 19, 2002

(54) BEVERAGE DISPENSER HAVING SELECTABLE TEMPERATURE

(76) Inventors: **Shlomo Greenwald**, Ithaca, NY (US); **Zipora Greenwald**, Ithaca, NY (US)

Correspondence Address:
BROWN & MICHAELS, PC
400 M & T BANK BUILDING
118 NORTH TIOGA ST
ITHACA, NY 14850 (US)

(21) Appl. No.: **09/930,324**

(22) Filed: **Aug. 15, 2001**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/769,151, filed on Jan. 24, 2001, now abandoned.

Publication Classification

(51) **Int. Cl.**[7] **B67D 5/62**; B67D 5/08

(52) **U.S. Cl.** **222/54**; 222/146.1; 99/279; 99/290; 222/144.5; 222/145.5

(57) **ABSTRACT**

The present invention dispenses hot coffee or other beverage by the cup at a selected temperature, which can be varied from cup-to-cup. The beverage is brewed in a conventional way, and in one embodiment is stored in a conventional holding tank at elevated temperature. The holding tank communicates with two smaller reservoirs. A quantity of beverage is stored in a first reservoir at an elevated temperature, at or above the maximum desired dispensing temperature. A second quantity of beverage is cooled and stored in a second reservoir at a lower temperature, at or below the minimum desired dispensing temperature. When a cup of beverage is to be dispensed, the temperature is selected, and a quantity of beverage is dispensed from each of the reservoirs, proportioned so that the resulting dispensed beverage is at the selected temperature. In another embodiment, the first reservoir is omitted, and beverage from the holding tank provides the elevated temperature beverage for mixing. In several other embodiments, no cooling mechanism is needed. Instead, the holding tank is at a cooler temperature than the lowest vend temperature, and the beverage must be heated to the hot reservoir temperature and, in one embodiment, the cold reservoir temperature. In another embodiment, the holding tank functions as a cold reservoir. In still another embodiment requiring no heaters, the holding tank is eliminated, and the beverage is held in insulated chambers at the higher and lower temperatures.

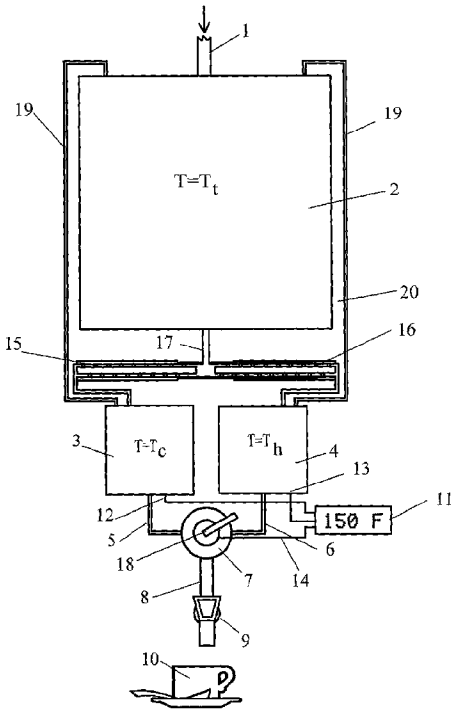

Fig. 1

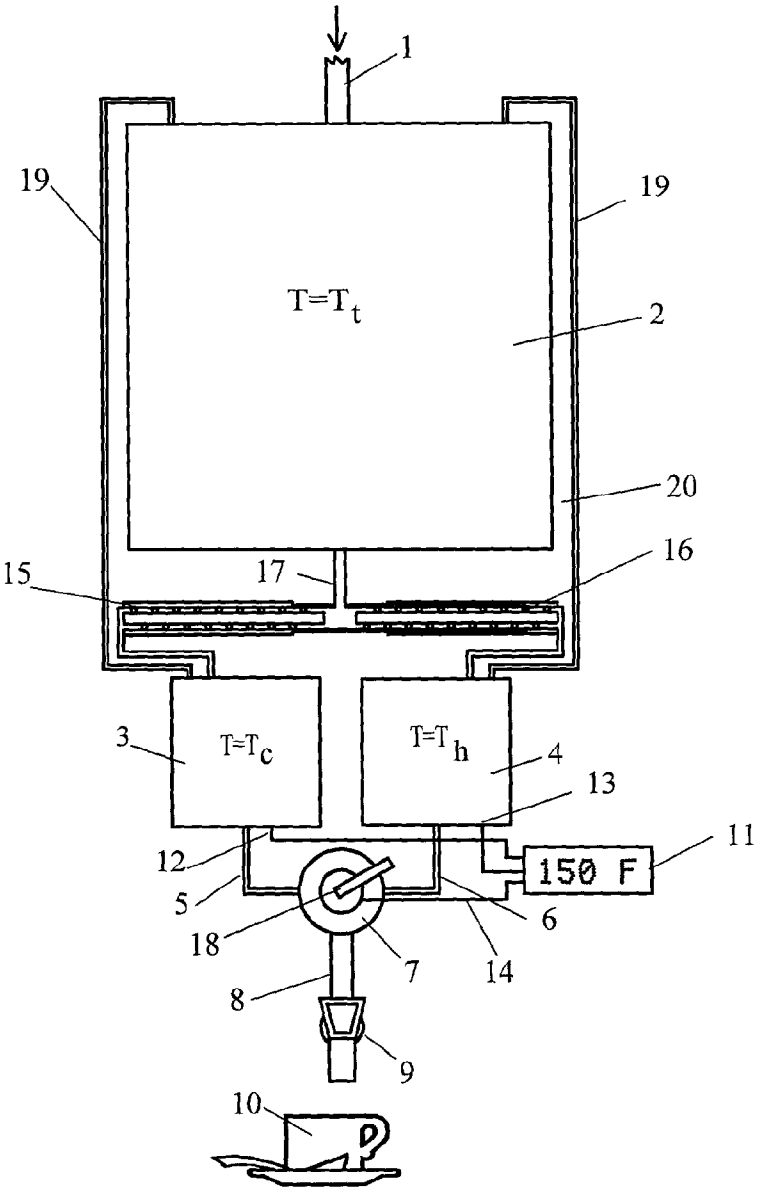

Fig. 2

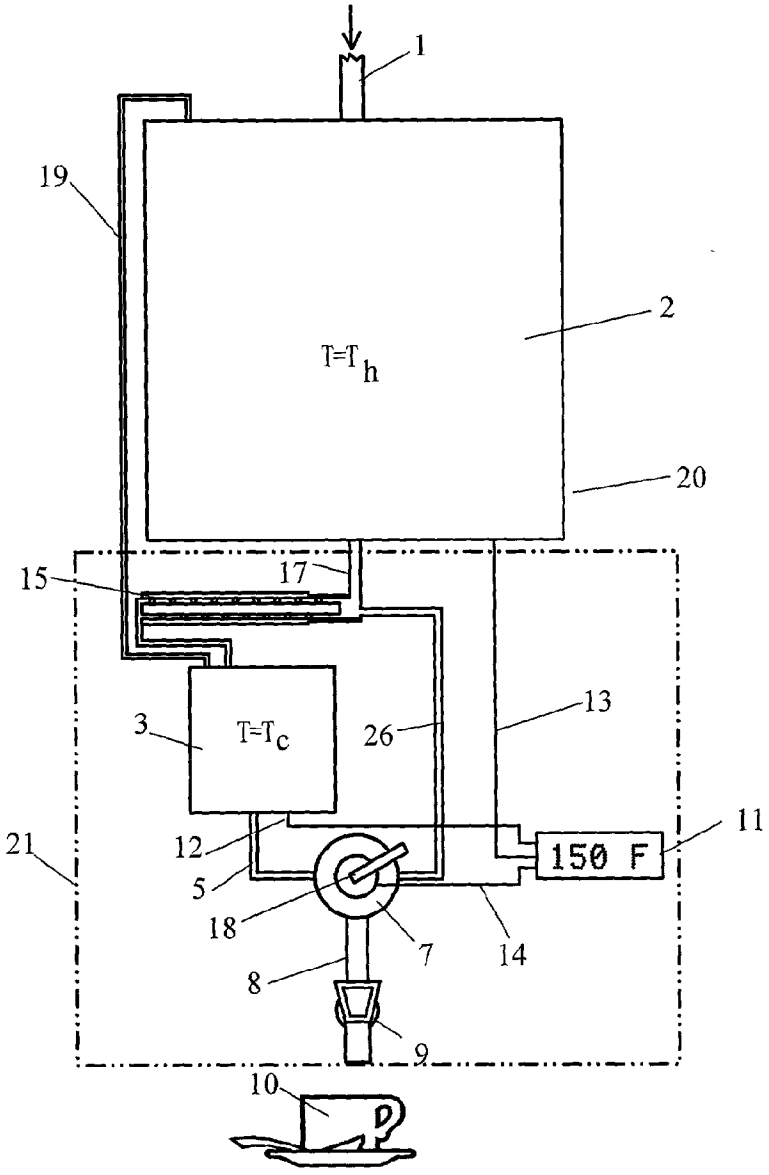

Fig. 3

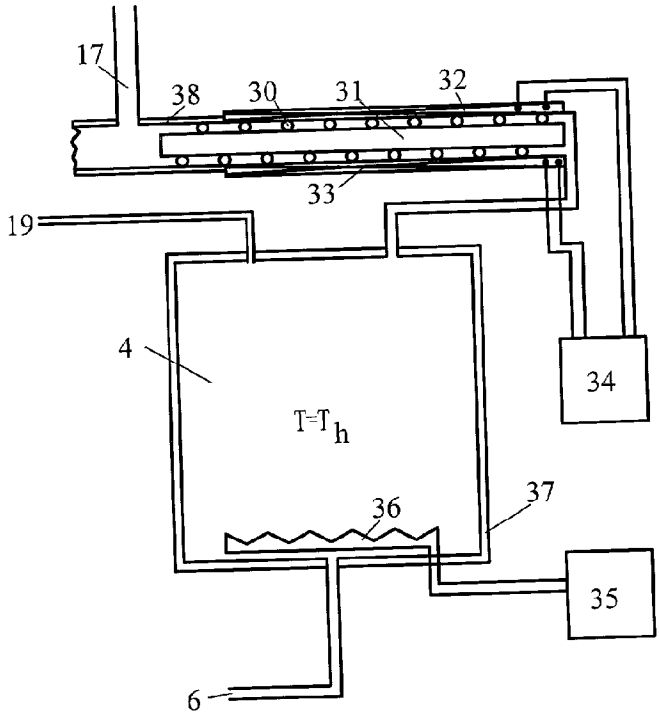
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Fig. 4

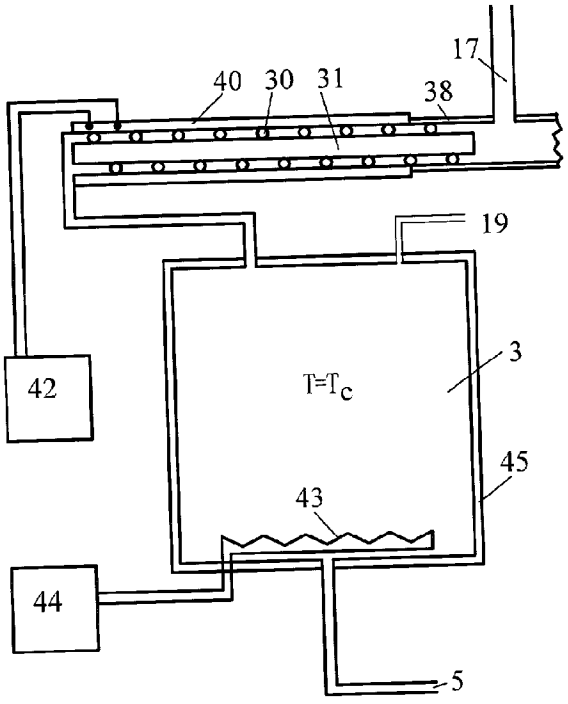
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Fig. 5

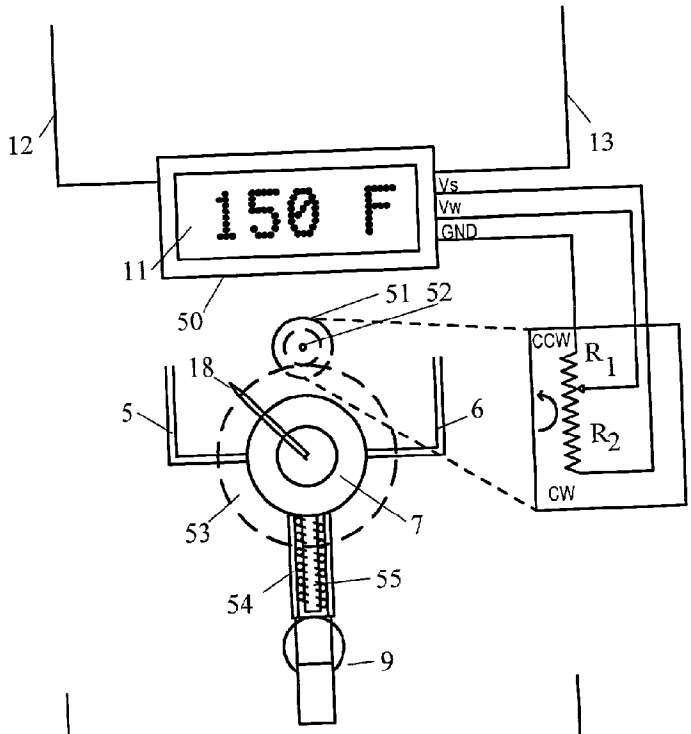
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Fig. 6

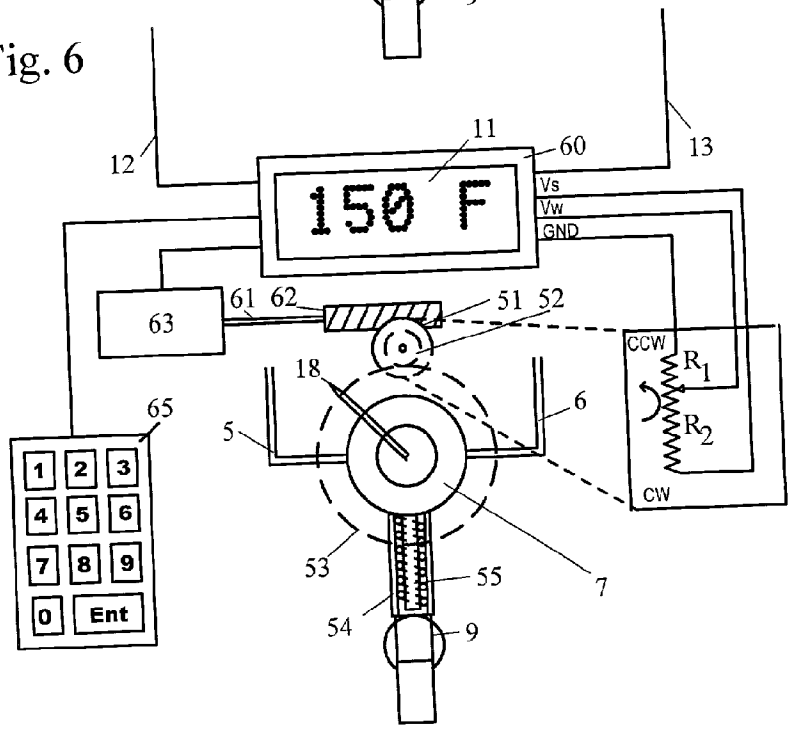
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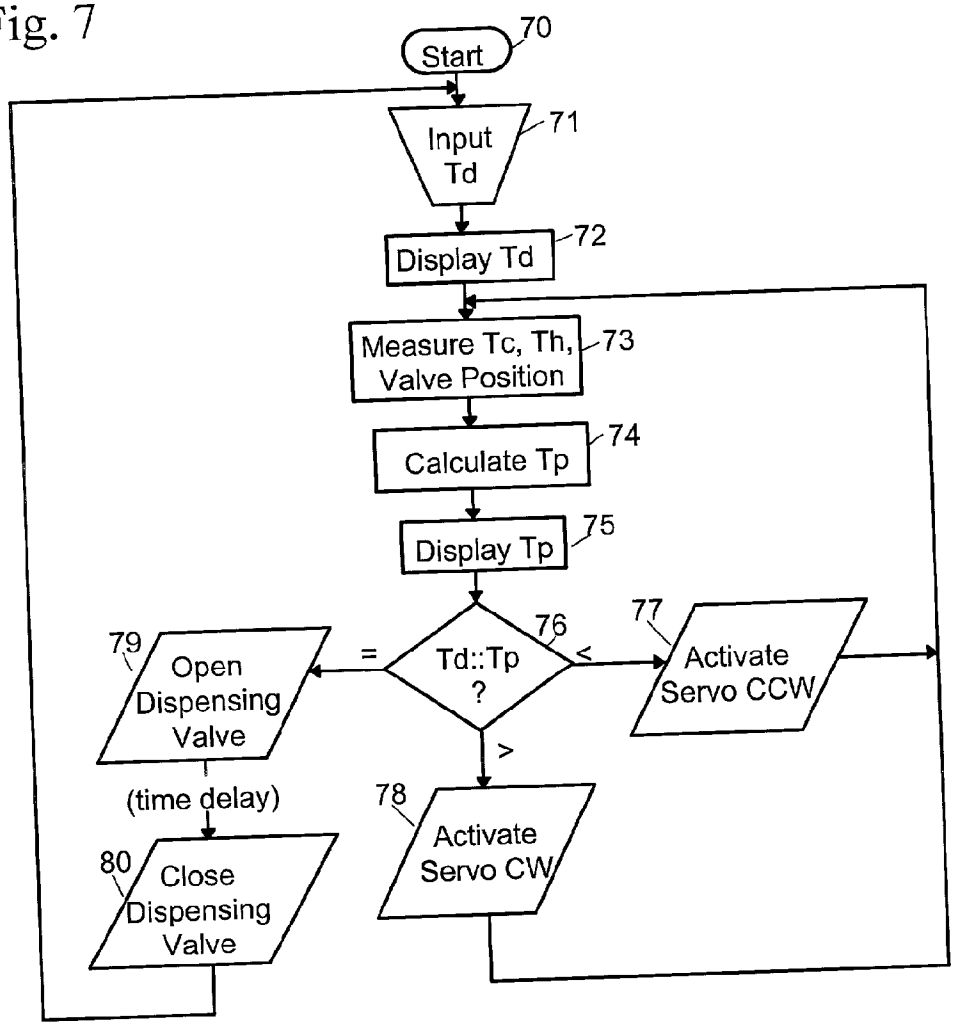
Fig. 7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(time delay)
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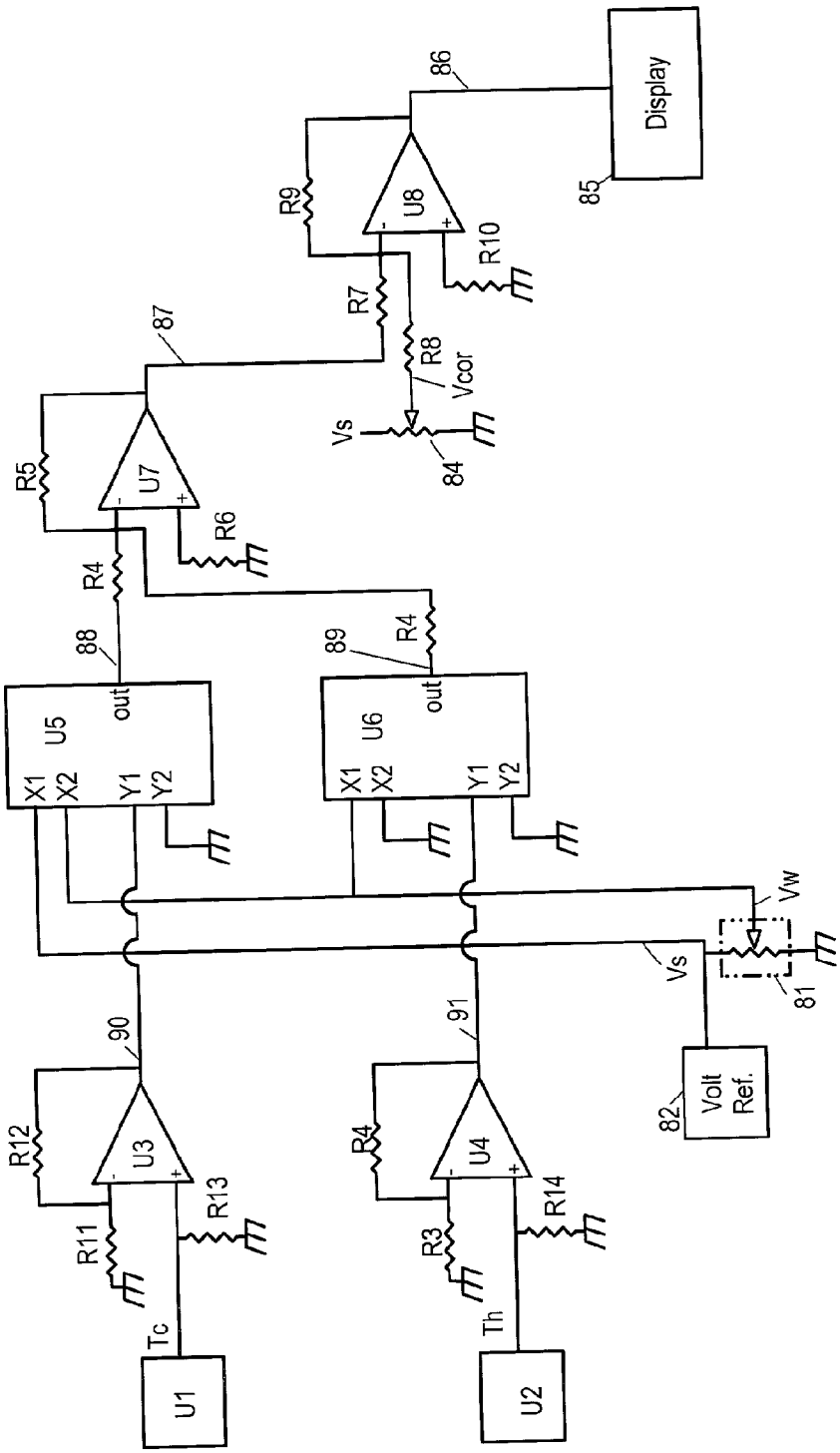
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U4
R12
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R14
R11
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Fig. 8

Fig. 9

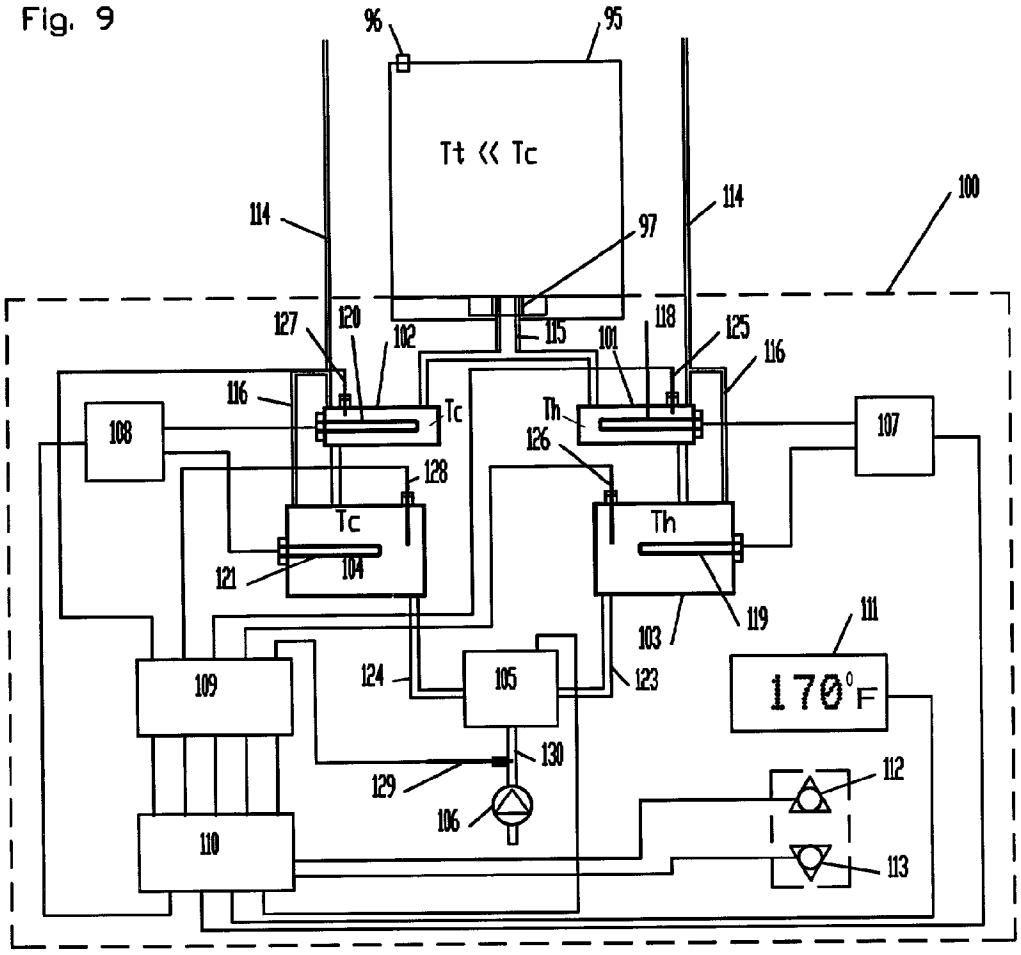

96
95
Tt << Tc
114
114
97
100
127
120
102
115
101
118
125
116
116
Tc
Th
108
107
126
128
Tc
Th
121
104
119
111
103
109
124
105
123
170°F
130
112
129
106
110
113

Fig. 10

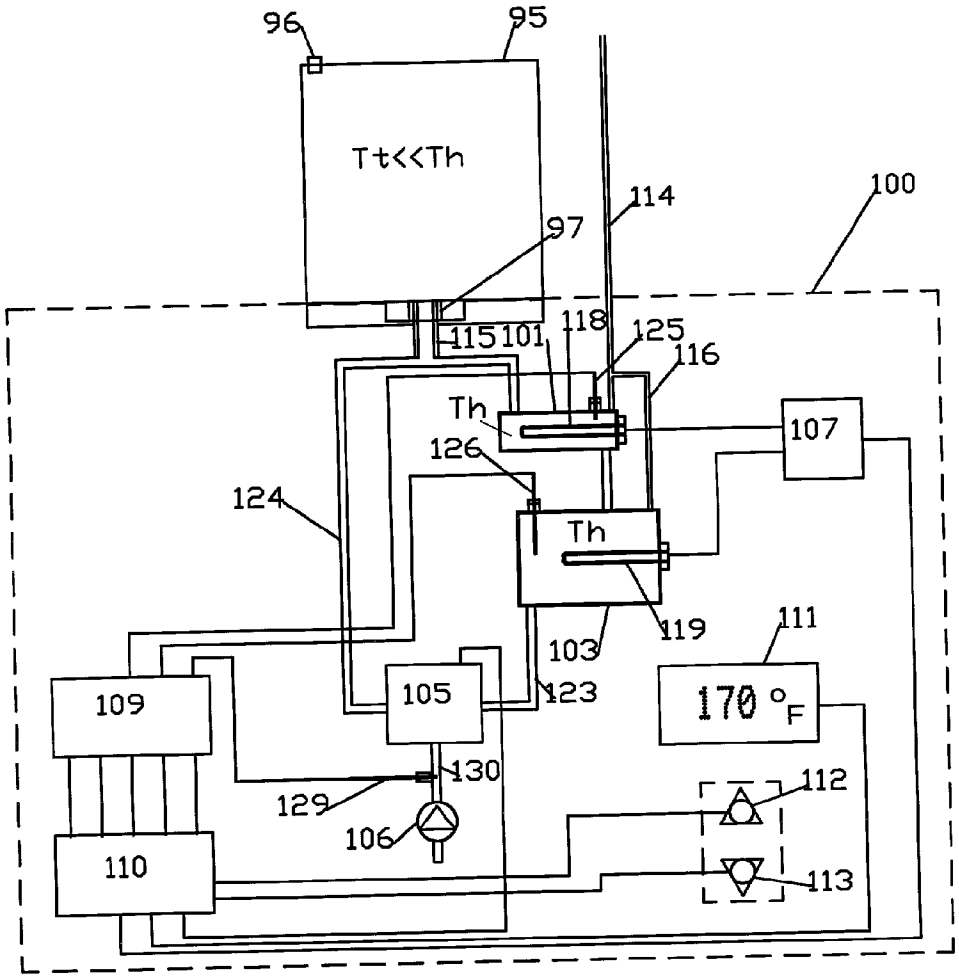

96
95
Tt<<Th
114
100
97
115
101
118
125
116
Th
107
126
124
Th
119
111
103
105
123
170 °F
109
130
112
129
106
110
113

Fig. 11

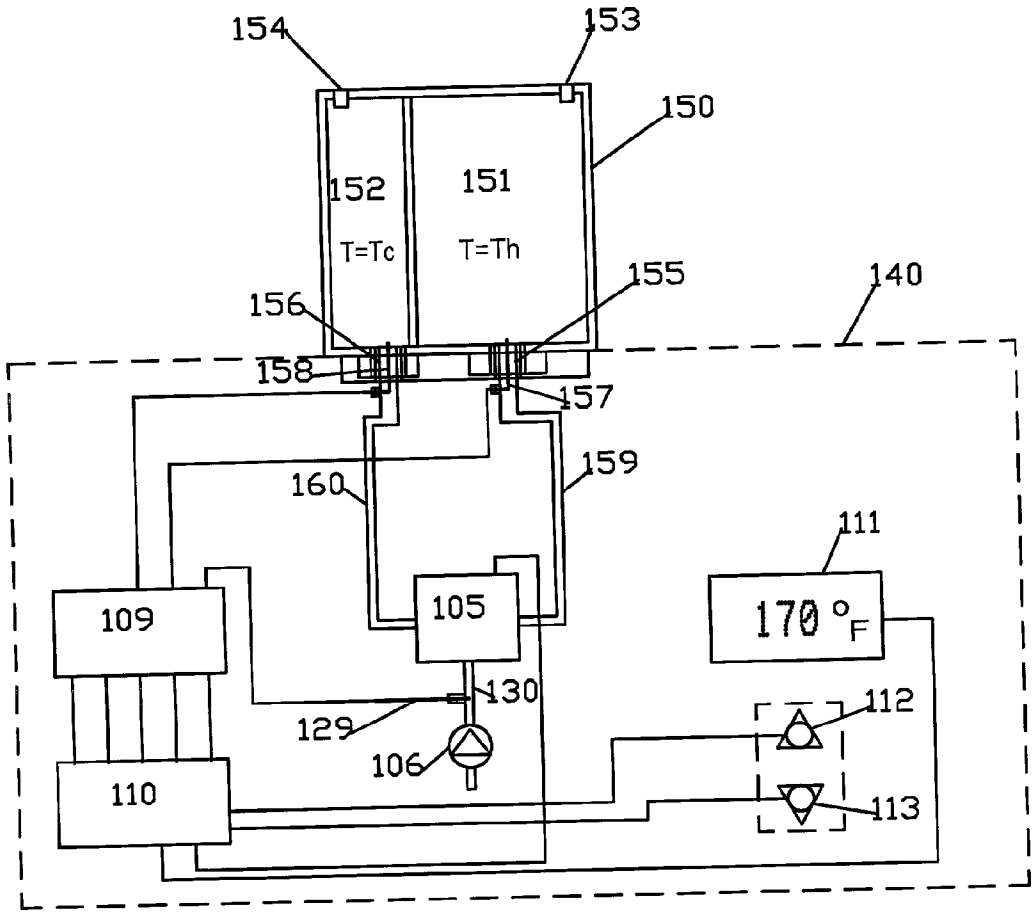
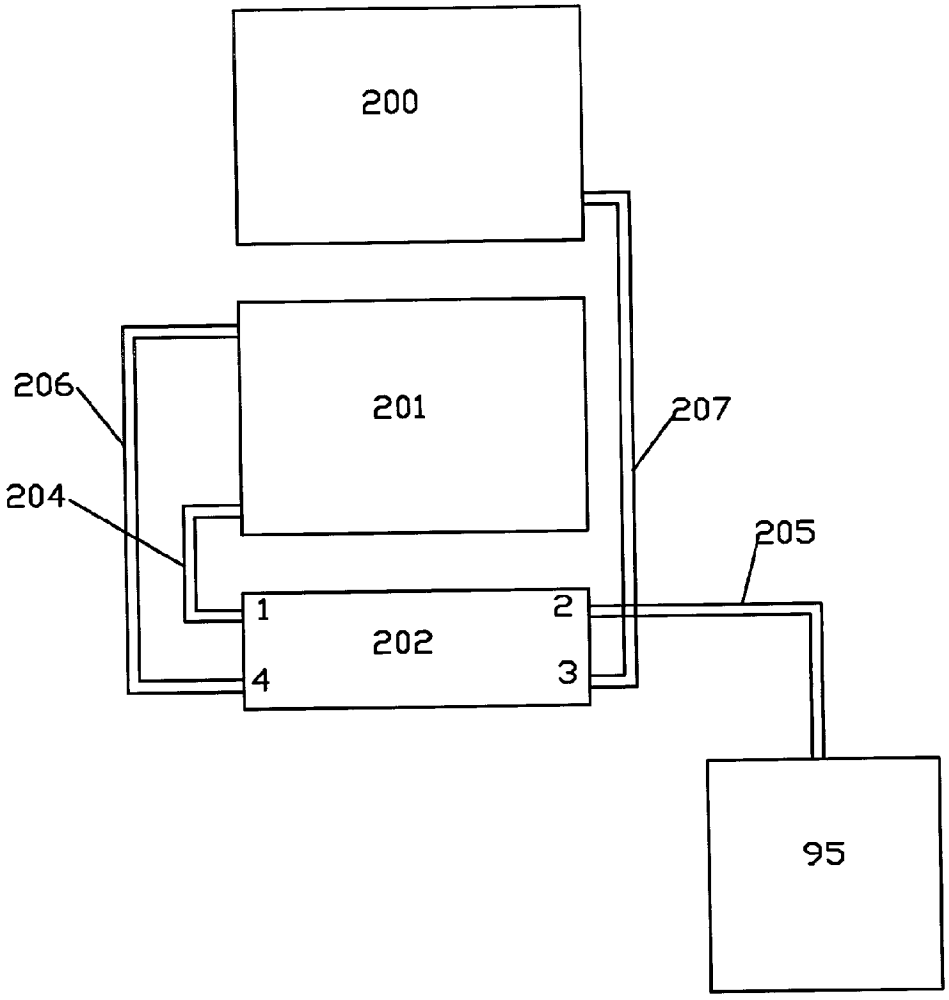

154
153
150
152
T=Tc
151
T=Th
155
140
156
158
157
159
160
111
109
105
170 °F
130
112
129
106
110
113

Fig. 12



BEVERAGE DISPENSER HAVING SELECTABLE TEMPERATURE

REFERENCE TO RELATED APPLICATION

[0001] This is a continuation-in-part of parent patent application Ser. No. 09/769,151, filed Jan. 24, 2001. The aforementioned application is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention pertains to the field of fluid dispensers. More particularly, the invention pertains to beverage dispensing machines having temperature regulation of the dispensed product.

[0004] 2. Description of Related Art

[0005] In most aspects of our life, each individual person has his or her own preferences. For example, people prefer different kind of food, different kind of spices in food and so on. This is also true when it comes to coffee—each person likes to drink his coffee at a different temperature. Especially in fast food restaurants and coffee shops, the temperature of the coffee that is sold is most often very hot, much too hot for most people to drink. So each person has to wait until his coffee will cool to his or her desired temperature, which might take 10 to 20 minutes. This become very irritating, especially when you want to drink your coffee right away and the only way to do it is by small sips, and even then you will burn your tongue. Since we have the free choice to buy our food according to our preference, why not the temperature of our coffee?

[0006] Industrial coffee machines typically have two main parts: a brewer and a container where the coffee is stored. Normally, for best results coffee is brewed at a temperature of near or just below boiling—about 200°-210° F. Then, the coffee is stored at a reduced temperature, so as not to cause the flavor to deteriorate too badly. The coffee temperature in the storing container is maintained at about 180° F. or more by a regulated or continuous heater or an outside heat plate.

[0007] Thus, the temperature of the coffee that is served is about 180° F., which is too hot to drink—for most people a drinkable coffee temperature is between 130° to 150° F. In fast food restaurants the coffee is served in paper cups, the paper material of the cup is a good heat insulator and has very small heat capacity. Therefore its takes quite a long time until the coffee cools down to the desired drinkable temperature for each individual. Since the customer does not know what is the coffee temperature he will probe the coffee temperature by taking small sips.

[0008] By doing so he might burn his tongue and the inside of his mouth. Also many customers would like to drink their coffee right away with their food and not have to wait until the coffee will cool to the desired temperature. One study showed that while coffee shops tend to serve coffee between 168° F. and 187° F., but a survey of 225 consumers showed the largest group preferred their coffee at 140° F. or 160° F. (O'Mahoney, et. al, "At What Temperature Should You Serve Coffee?", 1999 Annual Meeting of the Institute of Food Technologists, Report 50B-1).

[0009] There have been a number of U.S. patents covering devices for dispensing beverages, especially coffee or tea, at different temperatures.

[0010] Cornelius, U.S. Pat. No. 3,634,107, "Apparatus for Dispensing Coffee Beverage" (1972) is a vending machine which stores carbonate coffee concentrate at ambient temperature (or refrigerated non-carbonated concentrate). On a vending request, it mixes a selected volume of the coffee concentrate with cold and hot water to dispense coffee at a selected temperature and concentration. Unlike the present invention, Cornelius' vending machine does not dispense fresh coffee, and requires maintenance of volumes of water and coffee concentrate at various temperatures.

[0011] In Haynes, U.S. Pat. No. 4,550,651, "Batch-brewing Coffee System" (1985), coffee is brewed in batches, and stored at reduced temperature in a holding tank. When a cup is desired, the brewed coffee is heated by passage through a heat exchanger in a heating tank. The Haynes device cannot set a specific temperature for each cup of coffee.

[0012] In Verheijen, U.S. Pat. No. 4,791,860, "Equipment for Supplying Hot Water" (1988), the user sets temperature of water desired for beverage. The temperature is controlled by passing water through flow-through heater for specific time, then turning off heater or bypassing heater, so cold water is dispensed for specific time, mixing to produce water of selected temperature. Verheijn does not provide brewed coffee, but rather water of a selected temperature, and requires complicated flow-through heaters, mixing valves, and timing circuitry.

[0013] Kerner et al, U.S. Pat. No. 4,792,059, "Sealed Hot, Cold and Room Temperature Pure Water Dispenser" (1988) is a water dispenser which contains hot and cold reservoirs fed from holding tank. Three valves control water dispensed, so the user has a choice of hot, cold or water at something between room temperature and tap temperature, but cannot select a specific temperature of the water. Kerner does not brew coffee or other beverages, but is simply an office water cooler/heater which can dispense water at three temperatures.

[0014] Anson, et al, and Anson patents, assigned to the well-known industrial and office coffee-maker manufacturer Bunn-o-Matic, (U.S. Pat. Nos. 4,920,871, 5,584,229, and 5,858,437) all provide coffee brewers which can brew a beverage at the normal 200° F. temperature, but dispense it into a carafe at a reduced temperature, where it is presumably kept at the lower temperature for pouring into customers' cups. Anson's machines use a two-part brewing funnel which has a bypass channel for colder water. The hot brewing water goes through the coffee grounds or tea leaves in the center of the basket or funnel, and mix with the colder water in the bypass channel. Anson cannot vary the temperature of each cup of coffee (the customer's coffee is poured at whatever temperature the carafe is kept at), and the cooler the desired temperature, the more dilute the beverage as more cold water is mixed with the brew output.

[0015] Usherovich, U.S. Pat. No. 5,724,883, "Hot/Cold Beverage Brewing Device" (1998) is a home-type coffee or tea maker which, in addition to the conventional coffee brewing mechanism, has a second carafe which can store the brewed beverage at a lower temperature by passing the hot beverage through an exchanger with a cooling medium, and

then diluting the hot concentrate with cold water. There is no option for dispensing a cup of brewed beverage at a specific temperature, and, as a dilution system, the lower the temperature to be dispensed, the weaker the beverage.

SUMMARY OF THE INVENTION

[0016] The present invention dispenses hot coffee or other beverage by the cup at a selected temperature, which can be varied from cup-to-cup. The beverage is brewed in a conventional way, and in one embodiment is stored in a conventional holding tank at elevated temperature. The holding tank communicates with two smaller reservoirs. A quantity of beverage is stored in a first reservoir at an elevated temperature, at or above the maximum desired dispensing temperature. A second quantity of beverage is cooled and stored in a second reservoir at a lower temperature, at or below the minimum desired dispensing temperature. When a cup of beverage is to be dispensed, the temperature is selected, and a quantity of beverage is dispensed from each of the reservoirs, proportioned so that the resulting dispensed beverage is at the selected temperature. In another embodiment, the first reservoir is omitted, and beverage from the holding tank provides the elevated temperature beverage for mixing.

[0017] In the present invention the original but colder coffee is mixed with the original but hotter coffee to adjust the coffee temperature to the desired one. Because of this we preserve the coffee quality by not changing the strength or the taste of the coffee, only its temperature. This is superior to those systems which use cold water, diluting the coffee strength and changing its taste.

[0018] In the present invention the cold and the hot reservoirs are refilled automatically from the main holding tank. Therefore the system requires only one single mixing valve to control the coffee temperature, making the present system simpler and more reliable. The simple system of the invention also allows much more accurate control of temperature than the reheat or dilution systems.

[0019] The system of the invention can serve single users where each patron can choose and receive coffee at different temperature. In addition he will receive the coffee at the chosen temperature independent of the quantity he is pouring out.

[0020] In one embodiment, the system of the invention can be directly added to existing commercial coffee makers without making any changes to the coffee makers, improving the quality and the taste of the coffee because:

[0021] the coffee can be brewed at the optimal temperature to get the best coffee—about 200° F. Today, most coffee makers have a brewing temperature around 180° F. because of safety concerns.

[0022] in the two-reservoir plus holding tank embodiment of the invention, the coffee in the holding tank can be stored at lower temperature which will extend the time that the coffee can stand without loosing its quality. This is possible because in our system the coffee temperature that is poured out is independent on the coffee temperature in the holding tank.

[0023] Adding the system of the invention to existing coffee makers will eliminate the need of a heater or external hot plate used to keep the coffee in the holding tank at high temperature (180° F.). Instead only the small amount (5 to 10%) in the hot reservoir of the system has to be that hot. This will lower the cost of operating the coffee maker.

BRIEF DESCRIPTION OF THE DRAWING

[0024] **FIG. 1** shows a schematic representation of a first embodiment of the invention, having a holding tank and hot and cold reservoirs.

[0025] **FIG. 2** shows a schematic representation of a second embodiment of the invention, having a holding tank and a cold reservoir.

[0026] **FIG. 3** shows a schematic detail of a hot reservoir for use with the invention.

[0027] **FIG. 4** shows a schematic detail of a cold reservoir for use with the invention.

[0028] **FIG. 5** shows a schematic representation of a manual temperature selection mechanism for use with the invention.

[0029] **FIG. 6** shows a schematic representation of an automatic temperature selection mechanism for use with the invention.

[0030] **FIG. 7** shows a flowchart of a method of operation of the automatic temperature selection mechanism of **FIG. 6**.

[0031] **FIG. 8** shows a schematic of a circuit for use with the manual temperature selection mechanism of **FIG. 5**.

[0032] **FIG. 9** shows a schematic of a third embodiment of the invention having a portable holding tank and both hot and cold reservoirs.

[0033] **FIG. 10** shows a schematic of a fourth embodiment of the invention having a portable holding tank and a hot reservoir.

[0034] **FIG. 11** shows a schematic of a fifth embodiment of the invention having a portable holding tank with a hot chamber and a cold chamber.

[0035] **FIG. 12** shows a schematic of an apparatus for brewing and cooling the beverage at a brewing center.

DETAILED DESCRIPTION OF THE INVENTION

[0036] A schematic drawing of the coffee maker of the invention can be seen in **FIG. 1**. The coffee is brewed in a conventional manner, and the brewing mechanism is not shown. The brewed coffee enters a holding tank **(2)** through pipe **(1)** at whatever the brewing temperature is—typically between 195° F. and 205° F. The holding tank **(2)** is a conventional feature of industrial coffee brewers, and is typically around 10 gallons in size for a typical fast-food restaurant. The size of the holding tank is not important to the teachings of the invention.

[0037] The coffee temperature in the holding tank **(2)** is regulated at a temperature which is referred to as "T_t", which is lower than the temperature of the coffee after brewing (usually about 180° F.). The exact value of T_t will be determined by the requirements of the particular applica-

tion—a lower temperature will last longer, but if the temperature is too low it might require significant reheating for service.

[0038] In addition to the holding tank (2), this embodiment of the invention has two smaller reservoirs, referred to herein as the "cold" reservoir (3), kept at a temperature of T_c, and the "hot" reservoir (4), kept at a temperature of T_h. These reservoirs are smaller than the holding tank—in an embodiment where the holding tank is five to ten gallons, the reservoirs would preferably be about one-half to one gallon each. Smaller dispensing machines would use smaller reservoirs, but the reservoirs will need to contain at least a few cups of beverage each, as will be seen in the discussion below.

[0039] The "hot" temperature, T_h, will need to be greater than or equal to the highest temperature at which it would be desired to dispense the beverage—for most coffee dispensers a temperature of about 180° F. would be preferred, although some restaurants might want to have this even higher—as much as 195° F. According to one report (O'Mahoney, et. al, "At What Temperature Should You Serve Coffee?", 1999 Annual Meeting of the Institute of Food Technologists, Report 50B-1) coffee shops serve coffee between 168° F. and 187° F., and it is reported that McDonalds dispenses coffee at closer to 190° F.

[0040] The "cold" temperature, T_c, will need to be less than or equal to the lowest temperature at which it would be desired to dispense the beverage—about 120° F. is preferred, although this temperature could be set higher or lower as desired.

[0041] In a preferred embodiment, the coffee temperature in the holding tank (2) will be lower than the coffee temperature in the hot reservoir (4), but higher than the temperature in the cold reservoir (3) (i.e. $T_h > T_t > T_c$). As a result, the coffee from the holding tank (2) will need to pass from the exit pipe (17) through a heater (16) before it enters the hot reservoir (4), so its temperature will be close to the desired hot reservoir temperature T_h. On the other hand, the coffee from the holding tank (2) to the cold reservoir (3) will be cooled by a cooler (15) to be reduced to (or below) the cold reservoir temperature T_c. With the use of the heater (16) and cooler (15), the reservoir temperatures will not be significantly changed from the desired T_h and T_c as the supply of coffee in the reservoirs is drawn off and new coffee is drawn in from the holding tank (2).

[0042] Vent lines (19) lead from the hot (4) and cold (3) reservoirs back to the top of the holding tank (2) to avoid problems due to backpressure as coffee fills the reservoirs from the holding tank.

[0043] Output pipe (5) from the cold reservoir (3) and output pipe (6) from the hot reservoir (4) feed a mixing valve (7). In a simpler embodiment, the desired coffee temperature is selected by rotating the selector handle (18) on a mixing valve (7), which mixes the coffee coming from the cold reservoir (3) with the coffee coming from the hot reservoir (4). The mixed coffee is dispensed into the cup (10) from the mixing valve output (8) through a dispensing valve (9). The selected coffee dispensing temperature can thus vary continuously from T_c, (the temperature of the cold reservoir), if the mixing valve is set to draw only from pipe (5), to T_h, (the temperature of the hot reservoir) if the mixing valve is set to draw only from pipe (6). At any intermediate setting, the dispensing temperature will depend on the mixture.

[0044] **FIG. 2** shows an alternative embodiment of the invention, in which the hot reservoir is replaced by a direct feed line (26) from the holding tank (2). This embodiment can be built as a simpler version of the embodiment of **FIG. 1**, above, or installed as an add-on module (21) to an existing industrial coffee or other hot beverage maker, in which case the holding tank (2) will be the conventional holding tank in the coffee maker, and pipe (17) would be connected to the normal output of the coffee maker.

[0045] When built as an add-on module (21), the coffee temperature in the holding container of such coffee makers is sufficiently high (T_h~180 F.), that a separate hot reservoir is not needed. If built as a simpler add-on unit than the two-reservoir system of **FIG. 1**, the holding tank temperature would be set at a temperature which is at or above the hottest temperature at which it is desired to dispense the beverage ($T_t = T_h$). Instead, a line (26) from the output (17) of the holding tank (2) is connected directly to the hot inlet of the mixing valve (7). As in the first embodiment described above, the cold reservoir (3) is connected to the holding tank (2) output (17) via a cooling system (15) that cools down the incoming coffee from T_h to a temperature near T_c.

[0046] The rest of the system of this embodiment is the same as described above for the embodiment of **FIG. 1**.

[0047] **FIG. 3** shows a detail of the hot reservoir of the invention, as is used in the embodiment of **FIG. 1**. The volume of the hot reservoir (4) is small relative to the holding tank (2), preferably about one-half gallon or smaller, and it is preferably built with good heat insulation in its walls (37). In a preferred embodiment, the reservoir (4) is built with its walls in two layers, with air or vacuum between the walls, similar to a vacuum flask construction. Alternatively, foam or other insulation can be provided in the walls.

[0048] The temperature of the coffee in the reservoir (4) is continuously regulated to T_h, preferably within about ±1° F. using an inside heater (36), powered and controlled by conventional temperature regulating circuitry (35). The incoming coffee from output (17) of the holding tank will be heated by a heat exchange to closely match the coffee temperature T_h in the hot reservoir.

[0049] A preferred embodiment of a heat exchanger useful with the invention is built from an inner (31) and an outer (38) concentric tube, where the inner tube (31) is used as a filler and the coffee flows in between the two tubes. A wire (30) whose diameter is equal to the spacing between the two tubes (31) and (38) is wound in a helix type winding around the inner tube (31). This will force the coffee to flow in a thin layer very close to the outer tube (38), which is hot, in a helical long path. It will also convert the flow from laminar to a turbulent, which will increase the efficiency of the heating. The helical path can be made ten times longer then the straight path. The heat exchanger is preferably thermally insulated.

[0050] In order to be able to heat the incoming coffee very fast the heat exchanger will preferably have two heaters. A first heater (33) is low power which will operate continuously to keep the heat exchanger at high temperature approximately equal to T_h. The second heater (32) will operate in pulse mode, and will provide the power that is

needed to heat the incoming coffee. It may be turned on by the opening of the output valve and turned off by the closing of the output valve, or by sensing coffee flow in the exchanger, or thermally, or in any other way which might be desired. The heaters are powered and controlled by conventional control circuitry (**34**).

[**0051**] **FIG. 4** shows a detail of the cold reservoir (**3**) of the invention. As in the hot reservoir described above, the volume of the cold reservoir (**3**) is also preferably about one-half gallon or smaller, and it, too, is built with insulation (**45**) in the walls. Again, two layers walls with air or vacuum between the walls, as in a vacuum flask, will provide good heat insulation, or other insulating materials such as foam can be used.

[**0052**] The temperature of the coffee in the cold reservoir is continuously regulated to T_c, preferably within a range of ±1° F., using an inside heater (**43**) powered and controlled by conventional circuitry (**44**).

[**0053**] The incoming coffee from the output (**17**) of the holding tank is cooled down to a temperature approximately equal to, or slightly less than T_c by a heat exchanger. **FIG. 4** shows this heat exchanger structures much the same as the heat exchanger for the hot reservoir shown in **FIG. 3**: an inner (**31**) and outer (**38**) concentric tube, where the inner tube (**31**) is used as a filler and the coffee flows in between the two tubes. A wire (**30**) whose diameter is equal to the spacing between the two tubes (**31**) and (**38**) is wound in a helix type winding around the inner tube (**31**). This will force the coffee to flow in a thin layer very close to the outer tube (**38**), which is cooled by cooler (**40**), in a helical long path. It will also convert the flow from laminar to a turbulent, which will increase the efficiency of the cooling. The helical path can be made ten times longer then the straight path. The heat exchanger is preferably thermally insulated.

[**0054**] The cooler (**40**) used in this heat exchanger may work in any one of the ways known to the art, under the control of appropriate circuitry and supply (**42**). For example, tap water can be circulated around the exchanger, in which case (**42**) would comprise a pump or valve and circuitry to start and stop the pump or open and close the valve in a conventional manner in response to operation of the output valve, or by sensing coffee flow in the exchanger, or thermally, or in any other way which might be desired. Alternatively, the heat exchanger can be cooled by a forced air cooling system, in which a fan is used to increase the airflow across radiating fins. In such a case, (**42**) would be a power supply for the fan, in a conventional manner in response to operation of the output valve, or by sensing coffee flow in the exchanger, or thermally, or in any other way which might be desired. Other cooling methods, such as solid-state Peltier elements, controlled by appropriate circuitry, are possible within the teachings of the invention.

[**0055**] In its simplest form, the beverage dispensing system of the invention could use a simple mixing valve (**7**), with a calibrated scale showing the approximate temperature provided by the position of the handle (**18**). The position of the mixing valve determines the mixing ratio between the cold and the hot coffee. If desired, a thermometer, preferably digital, could read out the temperature of the beverage as it's dispensed, allowing for finer adjustment during dispensing.

[**0056**] It is preferred, however, to be able to dispense coffee or other hot beverages with the temperature regulated to a finer degree than would be possible with such a relatively crude setup. **FIGS. 5 and 6** show details of two temperature control systems which may be used within the teachings of the invention, which provide for manual and automatic adjustment of the temperature of the dispensed beverage, respectively.

[**0057**] In both figures, mixing valve (**7**) has a manual operating handle (**18**), which can select the proportion of cold and hot beverage dispensed from inlet pipes (**5**) and (**6**), respectively. The beverage output of the mixing valve (**7**) is preferably mixed in a mixing tube (**54**), which is preferably covered in thermal insulation (**55**), so as to maintain the selected temperature of the beverage as long as possible, and the flow is controlled by the dispensing valve (**9**). The output mixing tube is constructed in a similar way as the heat exchanger that was described in **FIGS. 3 and 4**. It is constructed in this way to ensure a) fast mixing between the hot and cold coffee b) to minimize the amount of the trapped coffee between the two valves.

[**0058**] Feedback of the position of the valve (**7**) is provided by ganging the valve (**7**) to a potentiometer (**51**) through gearing (**53**) and (**52**). For maximum accuracy, the potentiometer is preferably of the precision multi-turn type, and the gearing is chosen to rotate the potentiometer a number of times for a full revolution of the valve (**7**) handle (**18**) —a 5:1 or 10:1 ratio would be preferable, depending on the number of turns available on the potentiometer (five turn or ten turn). The potentiometer can be viewed as a voltage divider comprising two resistors R_1 and R_2 in series, in which the voltage present at the center of the divider (wiper) will be proportional to the position of the valve. The temperature of the cold reservoir is sensed by a sensor (**12**), and similarly the temperature of the hot beverage source (hot reservoir, as in **FIG. 1**, or holding tank as in **FIG. 2**) is sensed by sensor (**13**). A digital readout (**11**) preferably provides a display of the temperature

[**0059**] In the manual system of **FIG. 5**, the coffee temperature is selected by rotating the handle (**18**) on mixing valve (**7**). In order to ensure that the accuracy of the selected coffee temperature will not be effected by the fluctuation of the coffee temperature in the cold and hot reservoirs (or in the holding tank, in the embodiment of **FIG. 2**), the temperatures of the coffee in both reservoirs are continuously measured by sensors (**12**) and (**13**), and the measured temperatures at the time when the selection is made together with the mixing valve position is used to calculate the poured coffee temperature.

[**0060**] The poured coffee temperature T_p is given by:

$$T_p = \left(\frac{R_t - R_1}{R_t}\right)T_c + \left(\frac{R_t - R_2}{R_t}\right)T_h$$

[**0061**] where R_1 and R_2, as explained above, are the resistances of the two portions of the potentiometer on either side of the wiper, and $R_t=R_1+R_2$. Thus it can be seen that if $R_1=0$ when the mixing valve is turned all the way to the left (counterclockwise), and the hot coffee inlet is closed, then the output coffee temperature will be equal to the cold reservoir temperature T_c. On the other hand, if when $R_2=0$ the mixing valve is turned all the way to the right and the

cold coffee inlet is closed, the output coffee temperature will be equal to the hot reservoir coffee temperature.

[0062] It will be understood by one skilled in the art that in a practical circuit the values of R_1 and R_2 may be measured directly and the formula above used, or preferably, by using the potentiometer as a voltage divider—applying a voltage across the potentiometer and measuring the voltage at the wiper—the position of the wiper may be determined indirectly, and the temperature determined according to this formula:

$$T_p = \left(1 - \frac{V_w}{V_s}\right)T_c + \left(\frac{V_w}{V_s}\right)T_h$$

[0063] where V_w is the voltage at the wiper (junction of R_1 and R_2), and V_s is the source voltage applied across the potentiometer.

[0064] The display unit (**50**) for this embodiment of the invention, as shown in the schematic representation of **FIG. 5**, determines T_c from sensor (**12**), and T_h from sensor (**13**). As indicated in the figures, a source voltage V_s is applied to the full clockwise (CW) end of potentiometer (**51**) (the free end of R_2), a ground reference is applied to the full counterclockwise (CCW) end of potentiometer (**51**) (the free end of R_1), and V_w is read from the wiper (junction of R_1 and R_2). Using the formula above, when the user sets the handle (**18**) of the mixing valve (**7**) to a given position, the display unit calculates the temperature of the beverage which will be dispensed with the mixing valve (**7**) in its current position, and displays the temperature on the readout (**11**).

[0065] **FIG. 8** shows a detailed schematic of a circuit which could be used to implement the manual embodiment of **FIG. 5**. It should be noted that the conventional power supply wiring and chip connections is omitted in the schematic for simplicity. It will be understood by one skilled in the art that the circuit will require an appropriate power supply, depending on the integrated circuits chosen, and each IC will need appropriate connections to the power supply.

[0066] The two temperature inputs, T_c and T_h, are sensed by sensor ICs U1 and U2, respectively. These integrated circuits can be LM34 temperature sensors, manufactured by National Semiconductor. The LM34 accepts a voltage input of between +5 and +20 VDC, and outputs a voltage of +10.0 mV/° F.

[0067] The output T_c of sensor U1 is fed into the "+" input of an amplifier U3, preferably a low-noise operational amplifier such as an NE5534 integrated circuit from Texas Instruments or Signetics (although any of the many op amps available with suitable characteristics could be used). The "−" input is connected to ground with resistor R11, and also to the output of the op amp through resistor R12. The "+" input is also connected to ground through resistor R13 (R13=R11||R12). The output of the op amp V_c (**90**) is thus given by the formula,

$$V_c = \left(\frac{R11 + R12}{R11}\right)T_c$$

[0068] The mixer valve position resistor (**81**) is a multi-turn potentiometer, as described in **FIG. 5**, above, coupled to the mixer valve. One end of the potentiometer is fed by a regulated voltage V_s from a voltage reference (**82**), and the other end grounded. The voltage regulator is preferably any one of the many voltage regulator integrated circuits, such as an LM7810, available from many different manufacturers, or could be built with discrete components or a variable voltage regulator IC such as the LM317. The wiper voltage from the potentiometer V_w provides an indication of the position of the mixing valve.

[0069] V_s, V_w and V_c (**90**) are fed as the X1, X2 and Y1 inputs, respectively, into U5, an analog multiplier IC such as a MPY634 available from Burr-Brown. The Y2 input is grounded. The output (**88**) of the multiplier IC is given by the formula,

$$\text{Output}(88) = V_c\left(\frac{V_s - V_w}{10}\right)$$

[0070] Similarly, the output T_h of sensor U2 is fed into the "+" input of an amplifier U4, preferably a low-noise operational amplifier such as an NE5534 integrated circuit from Texas Instruments or Signetics (although any of the many op amps available with suitable characteristics could be used). The "−" input is connected to ground with resistor R3, and also to the output of the op amp through resistor R4. The "+" input is also connected to ground through resistor R14 (R14=R3||R4). The output of the op amp V_h (**91**) is thus given by the formula,

$$V_h = \left(\frac{R3 + R4}{R3}\right)T_h$$

[0071] V_w and V_h (**91**) are fed as the X1 and Y1 inputs, respectively, into U6 an analog multiplier IC such as a MPY634 available from Burr-Brown. The X2 and Y2 inputs are grounded. The output (**89**) of the multiplier IC is given by the formula,

$$\text{Output}(89) = \left(\frac{V_w V_h}{10}\right)$$

[0072] Output (**88**) of U5 and output (**89**) of U6 are fed, through resistors R4, into the "−" input of amplifier U7. As in U3 and U4, U7 can be any of the commonly available low noise operational amplifiers, such as the NE5534 integrated circuit from Texas Instruments or Signetics (although any of the many op amps available with suitable characteristics could be used). Feedback resistor R5 connects the "−" input to the output (**87**) of the op amp, and the "+" input is grounded by resistor R6 (R6=R4||R4||R5). Thus, the output (**87**) of U7 is given by the formula,

$$\text{Output}(87) = -\frac{R_5}{R_4}\left[\left(\frac{10 - V_w}{10}\right)V_c + \frac{V_w V_h}{10}\right]$$

[0073] Output (87) is fed, through resistor R7, into the "−" input of operational amplifier U8, which also can be any of the commonly available low noise operational amplifiers, such as the NE5534 integrated circuit from Texas Instruments or Signetics (although any of the many op amps available with suitable characteristics could be used). Feedback resistor R9 connects the "−" input to the output (86) of U8. A correction voltage V_{cor} is picked off a potentiometer (84), and fed to the "−" input of U8 through resistor R8. V_{cor} allows for correction of the output voltage for coffee in the valve, as discussed below, or for other inaccuracies in the system. The "+" input of the op amp is grounded through resistor R10 (R10=R7||R8||R9). The output (86) of U8 is thus given by the formula,

$$\text{Output}(86) = \text{Output}(87)R\frac{9}{R7} - V_{cor}R\frac{9}{R8}$$

[0074] Finally, the voltage at output (86) is read by digital display (85), which can be any one of many available digital voltmeters having an appropriate scale, such as 0-199 mV or the like.

[0075] In the automatic embodiment shown in FIG. 6, the customer or waitperson will type in the temperature of the coffee he would like to have on keyboard (65) and the control system (60) will rotate the mixing valve (7) to the right position using a motor (63) with a shaft (61) attached to a drive gear (62), which can couples to the smaller gear (51) on the potentiometer (51) or the larger gear (53) on the valve (7).

[0076] Once a temperature is entered on the keypad (65), the control system (60) will calculate the initial position of the mixing valve using the potentiometer (51) in the same way as was described in above. In addition, the control system, which will preferably work in a closed loop feedback mode, will calculate the temperature of the mixed coffee, using the inputs from sensors (12) and (13) and the valve position and the formulas above, and will adjust the position of the mixing valve (7) with the motor (63), until the mixing valve (7) is positioned such that the calculated mixed coffee temperature will match the selected temperature. The display (11) can be set to either display the selected temperature or the calculated temperature, or perhaps both, either simultaneously or alternately.

[0077] FIG. 7 shows a flowchart of a possible method of operation of this automatic temperature selection mechanism. The method of the flowchart works as follows:

[0078] 70. The method starts—variables are initialized, etc., in a conventional manner.

[0079] 71. The user inputs the desired temperature (T_d) at the keyboard (65).

[0080] 72. The system displays the entered temperature on the display (11) for confirmation. If desired, the system could require a confirming keystroke at this point.

[0081] 73. The temperature (T_c) of the coffee in the cold reservoir (3), the temperature (T_h) of the coffee in the hot reservoir (4) and the mixing valve (7) position are measured.

[0082] 74. The vend temperature (T_p) is calculated from T_c, T_p and the current valve position, in accordance with the formula

$$T_p = \left(1 - \frac{V_w}{V_s}\right)T_c + \left(\frac{V_w}{V_s}\right)T_h$$

[0083] where V_w is the voltage at the wiper (junction of R_1 and R_2), and V_s is the source voltage applied across the potentiometer.

[0084] 75. The vend temperature T_p calculated in step 74 is displayed on the display (11).

[0085] 76. The desired temperature T_d is compared to the vend temperature (T_p) at the current mixing valve setting.

[0086] 77. If $T_d<T_p$, the servo motor (63) is activated, turning the mixing valve (7) counterclockwise.

[0087] 78. If $T_d>T_p$, the servo motor (63) is activated, turning the mixing valve (7) clockwise.

[0088] The method then loops back from either step 77 or step 78 to measure the valve position and temperatures in step 73.

[0089] 79. If $T_d=T_p$, then the desired temperature has been reached, and the dispensing valve (9) is opened. This can be done automatically, or, if desired, manually by the customer or waitstaff.

[0090] 80. After a time delay to allow the cup to fill, the dispensing valve is closed, and the method loops back to await a new temperature entry at step 71.

[0091] In an even more automated application, in larger places where coffee is served to patrons the control system (60) of multiple coffee machines of the invention can be connected to the order entry registers. Customers will order the kind of coffee and the temperature of the coffee they would like to have. This information with the order I.D. number of each register will be stored in system memory in the control unit (60). When a restaurant employee fills a customer order, he/she will either use the keyboard to type in the customer order number, or might even recite the order number via a microphone (not shown). Using that information the control system (60) of the invention will automatically adjust the mixing valve (7) as described above, so the served coffee will have the ordered temperature.

[0092] If desired, the system can include some compensation for the effects on the vend temperature of the small amount of coffee trapped in the mixing valve (7), or between the mixing valve (7) and the dispensing valve (9). With appropriate attention to minimizing the amount of trapped coffee, these effects can be minimized, but there will still be some effect, since this coffee will be at some other temperature than the selected vend temperature of the coffee coming from the mixing valve once the flow starts. If there has been a while between vends, the coffee, this trapped coffee will have had time to cool off. If there is only a short time

between vends, the coffee will be at or near the last-selected vend temperature, which could be cooler or hotter than the current vend temperature.

[0093] The effects of trapped coffee can be compensated for by including an averaging factor for the known volume of the trapping volume. Alternatively, a temperature sensor at or near the vending valve **(9)** can measure the actual temperature of the coffee as it is dispensed, and compensate by slightly increasing or decreasing the vend temperature for part of the stream, or, as shown in the schematic in **FIG. 8, a** fixed compensation can be built into the circuitry.

[0094] The described in above are the preferred embodiment for the case when the coffee holding tank **(2)** is a part of a coffee maker. The coffee that is brewed at high temperature is stored in the holding tank **(2)** at high temperature and when the coffee runs out of the holding tank new coffee is brewed and stored in the holding tank. Using the beverage dispenser, as described in **FIG. 1** or **2**, each customer can select the temperature of his coffee as he or she desires.

[0095] The following embodiments of the invention, which are described in FIGS. **9** to **11**, are the preferred embodiments for the case when the coffee holding tank **(95)** is portable and is not attached to a coffee maker. The portable tank can be filled with fresh brewed coffee at a location that is far from the place where the coffee is served using the invention.

[0096] In this case the portable holding tanks can be filled with freshly brewed coffee at coffee brewing centers where the coffee can be brewed at the best conditions to achieve the highest coffee quality, preferred taste and any desired flavor. In order to preserve the coffee quality and taste the coffee will preferably be cooled down to low temperature while filling the portable tank by using heat exchangers. The portable tanks will be stored at low temperature. The portable tank will be delivered to the service location (restaurants, hotels, business offices, parties) where the portable tank **(95)** will be coupled to a beverage-dispensing-system as described in FIGS. **9** to **11**. Using the dispensing system each customer can select the temperature of his/her coffee as he/she wishes.

[0097] Brewing the coffee at brewing centers and delivering the coffee in portable tanks to the place of service and dispensing the coffee using the invention has a number of advantages compare to the way coffee is served today.

[0098] At brewing centers sophisticated brewing machines can be used to achieve higher quality and better tasting coffee, which are too expensive to be used in restaurant or business offices

[0099] Because of the centralization, the high quality coffee can be delivered to any place at lower price than it will cost to make at the service location using their own coffee maker.

[0100] These embodiments of the invention will probably cost less than an average size coffee maker.

[0101] There will also be the option of renting the beverage dispenser having selectable temperature from the coffee distributor either for a single use (party) or for a longer term use (restaurants or business offices). It will eliminate the burden and save the time of preparing the coffee. It will give the business owner the freedom to order a different quantity of coffee i.e, different size tank, according to the need per that day. It will allow each place to have many different coffee flavors. Using the invention will allow each patron to choose the temperature of his coffee as he desires.

[0102] A schematic drawing of this embodiment of the invention to which a portable coffee tank is coupled can be seen in **FIG. 9**. The coffee is brewed at a brewing center, where sophisticated brewing machines and methods will be used to achieve high quality coffee. The very hot coffee coming out of the brewer will preferably be cooled down to room temperature or cooler to preserve the quality and taste of the coffee for a longer time. The cooling can be done using a brazed plates heat exchanger, in which the cooling water, whose temperature at the exit of the heat exchanger will be only few degrees lower than the hot coffee coming out of the brewer, will be returned to the coffee brewer as hot water. This will allow saving of up to 70-80 percent of the power that is needed to heat up the water in the brewer as will be explained in **FIG. 12**.

[0103] In the following embodiments of the machine of the invention, therefore, there is no need for cooling the coffee to T_c as in the embodiments described above, eliminating the need for cooling elements in the machine. If the cooler coffee for the mixing valve is modified in temperature from the tank coffee at all, it will be heated—a more economical approach, as heating elements are less expensive than cooling systems.

[0104] The cold coffee will be stored in portable holding tanks **(95)** having different sizes. The portable tank **(95)** has a vent valve **(96)** on the top and a special coupling valve **(97)** to the dispensing system on the bottom. The freshly brewed cold coffee will be delivered to the locations of service (restaurants, business-offices, hotels, parties, and more) where the portable tank **(95)** will be coupled to the system of the invention **(100)**. Using this dispensing system each patron will be able to choose the temperature of his coffee as he desires.

[0105] The coffee temperature in the portable tank **(95)**, which is referred to as "T_t" , is at room temperature or cooler. The exact value of T_t will be determined by the requirements to preserve the quality and taste of the coffee for a long time.

[0106] In this embodiment of the invention the dispensing system has two reservoirs referred to herein as the "hot" reservoir **(103)**, kept at regulated temperature T_h, and the "cold" reservoir **(104)**, kept at regulated temperature T_c. The volume of these reservoirs are smaller than the portable tank, preferably one half gallon to one gallon each.

[0107] The "hot" temperature T_h will need to be greater than or equal to the highest temperature at which it will be desired to dispense the beverage. For most coffee dispensers a temperature of 180-190 ° F. would be preferred. The "cold" temperature T_c will be less than or equal to the lowest temperature at which it would be desired to dispense the beverage—about 120-130° F. is preferred, although this temperature can be higher or lower as desired.

[0108] In the preferred embodiment, the coffee temperature in the portable tank **(95)** will be much lower then the temperature of the "cold" reservoir **(104)** (i.e. $T_h > T_c >> T_t$). As a result, the coffee from the portable tank **(95)** will need to pass from the exit pipe **(115)** through a "fast heater" **(101)**

before its enters the hot reservoir (**103**), so its temperature will be close to the desired hot reservoir temperature T_h. Also, the coffee from the portable tank (**95**) will need to pass from the exit pipe (**115**) through an additional "fast heater" (**102**) before its enters the cold reservoir (**104**), so its temperature will be close to the desired cold reservoir temperature T_c. The preferred internal volume of the "fast heaters" (**101**,**102**) is equal to the size of a large cup of coffee (12-16 oz.) and the coffee temperature in the "fast heaters" is regulated to be equal to T_h and T_c, respectively. In this way, the moment a serving of coffee is dispensed, the new coffee that is entering the reservoir (**103**) from the fast heater (**101**) and reservoir (**104**) from the fast heater (**102**) will be at the right temperature. Therefore, it will not cause significant temperature fluctuation in the hot and cold coffee reservoirs. The new cold coffee that is drawn from the portable tank into the "fast heater" (**101**) and (**102**) will be heated by the fast heating elements (**118**,**120**). Assuming 1500 watt heating elements (**118**,**120**) are used in the "fast heaters", the system will be able to dispense 150 large cups of coffee per hour—five gallons of coffee.

[**0109**] The heating elements (**119**) and (**121**) in the hot and cold reservoir are used mainly for temperature regulation.

[**0110**] Vent lines (**116**) from the hot and cold reservoirs (**103**,**104**) and vent lines (**114**) from the "fast heaters" (**101**,**102**) lead back to the top of the portable tank (**95**) to avoid flow problems due to back pressure as coffee fills the "fast heaters" and the reservoirs.

[**0111**] Output pipe (**123**) from the hot reservoir (**103**) is connected to one input of the mixer valve (**105**) and output pipe (**124**) from the cold reservoir (**104**) is connected to the second input of the mixer valve (**105**). The mixed coffee is dispensed into a cup from the mixer valve output (**130**) through a dispensing valve (**106**). The selected coffee dispensing temperature can be thus varied continuously from T_c (the temperature of the cold reservoir) if the mixer valve is set to draw only from the cold reservoir, to T_h (the temperature of the hot reservoir) if the mixer valve is set to draw only from the hot reservoir. At any intermediate setting, the dispensing coffee temperature will depend on the mixture.

[**0112**] The preferred mixer valve (**105**) will be constructed by coupling two linear valves using a 1:1 ratio gear and using commercial valve driving controller which uses a step-motor and microprocessor to drive one valve. Since the two valves are coupled together by a 1:1 gear, when one will be opened the second will be closed by the same amount.

[**0113**] The input command to the valve controller is preferably either a voltage in the range of 1 to 5 volts or a current of 4 to 20 ma. For a 1 volt (4 ma) input command the master valve (the valve that is driven by the step motor) will be closed and the slave valve will be open while for a 5 volt (20 ma) input command the master valve will be open and the slave valve will be close. At any intermediate input command the relative position of each valve is linearly proportional to the input command voltage (current).

[**0114**] The temperatures of the coffee in the "fast heater" (**101**,**102**) and the reservoirs (**103**,**104**) are continuously measured using temperature sensors (**125**,**126**,**127**,**128**. The sensors are connected to the electronics interface board (**109**) which amplify and scales the sensors signal. The output of the interface board (**109**) is connected to the system main microprocessor (**110**). The microprocessor (**110**) uses the measured temperatures to regulate the coffee temperatures in the "fast heaters" (**101**,**102**), the hot (**103**) and the cold (**104**) reservoirs. The regulating output, TTL level signals, from the microprocessor are connected to the heating elements (**118**,**119**,**120**,**121**) interface board (**107**, **108**) which include fast switching transistors and relays. The relays are used to switch on/off the AC voltage to the heating elements as needed.

[**0115**] The temperature of the dispensed coffee is selected by using two control buttons, the "up" button (**112**) and the "down" button (**113**), and the selected temperature is displayed in the numerical display (**111**). By pressing once on the up button (**112**) the dispensed coffee temperature will increment by a chosen amount—preferably one degree—and by pressing once on the down button (**113**) the dispensed coffee temperature will decrement by the same amount. By pressing continuously on the up/down buttons the dispensed coffee temperature will be increased/decreased continuously—preferably at a rate of about three degrees per second—and the temperature display (**111**) will also change at the same rate.

[**0116**] The system microprocessor (**110**) will adjust the mixer valve (**105**) position to correspond to the new selected coffee temperature at the same rate of three degrees per second.

[**0117**] The microprocessor (**110**) uses the measured temperature T_h (**126**) of the hot reservoir (**103**) and the measured temperature T_c (**128**) of the cold reservoir (**104**) and the newly selected coffee temperature T_p to calculate the new position of the master valve.

[**0118**] The microprocessor (**110**) can use the following algorithm:

[**0119**] If we define a parameter X as the position of the "master" valve (the valve which is driven by the step-motor) and 1−X as the position of the "slave" valve we can write the selected coffee temperature as

$$T_p = XT_c + (1-X)T_h$$

[**0120**] From which we can find that the new position X of the master valve corresponding to T_p is given by

$$X = \frac{T_h - T_p}{T_h - T_c}$$

[**0121**] where the parameter X can change from 0 (closed valve) to 1 (completely open valve).

[**0122**] In the above derivations the output (**124**) of the cold reservoir (**104**) is connected to the master valve input while the output (**123**) of the hot reservoir (**103**) is connected to the slave valve input.

[**0123**] In practice, the mixer valves are not exactly linear in the whole range from closed to open position. Therefore, in order to ensure that the dispensed coffee temperature will be whitin one degree of the selected one, we will provide fine position adjustment by feedback from the actual dispensed coffee temperature. The actual dispensed coffee temperature is measured by temperature sensor (**129**) which

is mounted at the mixer valve output pipe (**130**). The fine adjustment is accomplished by modifying the mixer valve positions that correspond to the selected temperature:

$$X = \frac{T_h - T_p + T_f}{T_h - T_c}$$

[**0124**] Where T_f is the correction from feedback. T_f is obtained by periodically accumulating the error of the outlet temperature—preferably about fifteen times per second. Each time T_f is incremented by the scaled difference between the actual dispensed coffee temperature T_o and the selected coffee temperature T_p:

$$T_f = S^*(T_o - T_p) + T_f, \text{ with } -T_m < T_f < T_m,$$

[**0125**] Where T_m is a limit on the maximum magnitude of the feedback correction. From this, one can see that if T_o is too high, the controller (**110**) will progressively increase X. i.e. increase the flow rate from the cold reservoir and decrease the flow rate from the hot reservoir until T_o is correct, and the opposite if T_o is too low. S is a scale factor that determines the response time of the feedback. The constants S and T_m together determine the amount of temperature overshoot that will occur when dispenser flow is started, and can be adjusted to compensate for cool-off of the coffee trapped in the outlet pipe and the mixer valve (**105**) between uses.

[**0126**] **FIG. 10** shows an alternative embodiment of the invention, in which the cold reservoir (**104**) and the "fast heater" (**102**) are replaced by a direct feed line (**124**) from the cold portable tank (**95**) to the input of the mixer valve (**105**). This embodiment can be built as a simpler version of the embodiment of **FIG. 9**. As in the embodiment described in **FIG. 9**, the hot reservoir (**103**) is connected to the portable tank (**95**) output (**115**) via a fast heater (**101**) that heats up the incoming coffee from T_t to T_h.

[**0127**] The rest of the system of this embodiment is the same as described above for the embodiment of **FIG. 9**.

[**0128**] In case where there are no adequate power outlets to operate the beverage-dispenser, such as at outdoor events or conferences at hotels where the coffee is rolled in during coffee break the preferred embodiment of the invention is shown in **FIG. 11**. In this embodiment, the coffee is stored at the Brewing Center in a special insulated portable tank (**150**) which is divided into two chambers (**151**,**152**). The very hot coffee coming out of the brewer is stored in the large chamber (**151**) while the cooled down coffee is stored in the smaller chamber (**152**). The coffee that is stored in the smaller chamber (**152**) is cooled to room temperature or higher as it comes out of the brewer using a heat exchanger as is described in **FIG. 12**. The special portable tank (**150**) has two vent valves (**153**,**154**) at the top and two output ports (**155**,**156**). At the place of service the portable tank (**150**) is coupled to the apparatus of the invention (**140**).

[**0129**] In this simplified dispenser, the coffee from the hot chamber (**151**) is connected directly via a pipe (**159**) to one input of the mixer valve (**105**) while the cold coffee from the smaller chamber (**152**) is connected directly via a pipe (**160**) to the second input of the mixer valve (**105**). The mixed coffee is dispensed into a cup from the mixer valve output pipe (**130**) through a dispensing valve (**106**). The main microprocessor (**110**) is using the continuously measured temperatures of the coffee in the hot chamber (**151**), T_h, by the temperature sensor (**157**) and the coffee in the cold chamber (**152**), T_c, by temperature sensor (**158**), and the selected temperature, T_p, to calculate and adjust the mixer valve position as was described in the embodiment of **FIG. 9**. The rest of the dispenser system is the same as was described in **FIG. 9**.

[**0130**] This embodiment of the system (**140**) will preferably be operated by batteries similar to the one used in power tools. Each dispenser will include two batteries, one active and the other as backup.

[**0131**] An alternative method to operate the dispenser (**140**) will be to use a low power battery to operate the controller electronics and select the desired coffee temperature using a manual system as was described in **FIG. 5**. The dispensed coffee temperature corresponding to the new position of the mixer valve (**105**) will be calculated by the microprocessor (**110**) and displayed in the numerical display (**111**).

[**0132**] In the above embodiment of the invention, even so the coffee is stored in the portable tank at high temperature, the high quality and taste of the coffee will be preserved since it will be stored in the portable tank only for relatively short time. Because in outdoor events and conferences coffee break the coffee is consumed in short time.

[**0133**] At the brewing center the freshly brewed hot coffee will be cooled down before it will be stored in the portable tank (**95**). In **FIG. 12 a** cooling method is shown which will allow saving 70-80 percent of the power that is needed to heat up the water for the coffee in the brewer.

[**0134**] In this method, the cold water for the coffee which is stored in holding tank (**200**) is also used to cool the hot coffee coming out of the brewer (**201**) using a brazed plates Heat-Exchanger (**202**). The hot brewed coffee coming out from the brewer (**201**) is connected by pipe (**204**) to the Heat-Exchanger (**202**) hot side input port #1. The cooled down coffee exits through the hot side output port #2 which is connected via pipe (**205**) to the portable tank (**95**). The cold water from tank (**200**) is connected by pipe (**207**) to the Heat-Exchanger cold side input port #3. The heated water exits through the cold side output port #4 which is connected via pipe (**206**) to the water input of the coffee brewer (**201**). Since the temperature of the water at the exit from the Heat-Exchanger will be only few degrees cooler than the temperature of the hot coffee coming out of the brewer (**210**), upon entering the coffee brewer it will need to be heated only by an additional few degrees.

[**0135**] Accordingly, it is to be understood that the embodiments of the invention herein described are merely illustrative of the application of the principles of the invention. Reference herein to details of the illustrated embodiments is not intended to limit the scope of the claims, which themselves recite those features regarded as essential to the invention.

What is claimed is:

1. A beverage machine for dispensing hot beverages at a selected temperature in a range between a higher temperature and a lower temperature, comprising:

a) a brew inlet for accepting the beverage from a source of prepared beverage;

b) a holding tank for holding the beverage at a selected temperature at least as high as the higher temperature, having an inlet connected to the brew inlet, an outlet, and a heater for maintaining beverage at the selected temperature;

c) a cold reservoir for holding the beverage at a selected temperature no higher than the lower temperature, having an inlet for accepting beverage, an outlet, and a heater for maintaining beverage at the selected temperature;

d) a cooler for lowering the temperature of a beverage, having an input connected to the outlet of the holding tank and an output connected to the inlet of the cold reservoir, such that hot beverage from the holding tank is cooled as it passes through the cooler to the cold reservoir;

e) a mixing valve having a first input connected to the outlet of the cold reservoir, a second input connected to the outlet of the holding tank, and an output producing a mixture of fluid from the first input and second input, the proportions of fluid in the mixture from the first input and the second input being controlled in response to the position of the mixing valve control; and

f) a vending valve having an input connected to the output of the mixing valve and an output for dispensing the beverage;

such that when the vending valve is opened, beverage is dispensed having a temperature determined by the position of the mixing valve control, mixing beverage from the holding tank and beverage from the cold reservoir.

2. The beverage machine of claim 1, further comprising a temperature display for showing the temperature of the beverage to be dispensed, comprising:

a) a first temperature sensor for measuring the temperature of the cold reservoir;

b) a second temperature sensor for measuring the temperature of the holding tank;

c) a valve position sensor coupled to the mixing valve, having an output which is proportional to the position of the mixing valve control;

d) a display for displaying a temperature;

e) a display control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the valve position sensor, and an output connected to the display,

the display control circuit reading the temperatures of the holding tank and cold reservoir through the first and second sensors, and the proportion of beverage dispensed from the reservoirs at the position of the mixing valve, and displaying on the display the temperature of the beverage which would be dispensed.

3. The beverage machine of claim 1, further comprising a dispensed beverage temperature control for selecting a dispensing temperature, comprising:

a) a first temperature sensor for measuring the temperature of the cold reservoir;

b) a second temperature sensor for measuring the temperature of the holding tank;

c) a valve position sensor coupled to the mixing valve, having an output which is proportional to the position of the mixing valve control;

d) a motor coupled to the mixing valve; and

e) a temperature control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the valve position sensor, and an output connected to the motor,

the temperature control circuit reading the temperatures of the holding tank and cold reservoir through the first and second sensors, and the proportion of beverage dispensed from the reservoirs at the position of the mixing valve, and driving the motor to turn the mixing valve to dispense beverage at the selected dispensing temperature.

4. The beverage machine of claim 3, further comprising a keypad connected to the temperature control circuit, such that the dispensing temperature is entered into the control circuit through the keypad.

5. The beverage machine of claim 3, further comprising a display connected to the control circuit, the control circuit displaying the selected dispensing temperature on the display.

6. The beverage machine of claim 1, in which the cooler comprises:

a) an outer tube having a first end connected to the outlet of the holding tank and a second end connected to the inlet of the cold reservoir;

b) a heat exchanger surrounding at least part of the outer tube;

c) an inner tube having closed ends, fitted coaxially inside the outer tube, leaving an annular gap between the inner tube and the outer tube;

d) a wire wound helically around the inner tube, substantially filling the annular gap between the inner tube and the outer tube, such that beverage flowing in the first end of the outer tube is guided helically around the inner tube through the annular gap to the second end of the outer tube.

7. The beverage machine of claim 6, in which the heat exchanger comprises tubes carrying cooled fluid.

8. The beverage machine of claim 7, in which the fluid is water.

9. The beverage machine of claim 6, in which the heat exchange comprises fins for air cooling on the outside tube, and a fan for moving air over the fins.

10. A beverage machine for dispensing hot beverages at a selected temperature in a range between a higher temperature and a lower temperature, comprising:

a) a brew inlet for accepting the beverage from a source of prepared beverage;

b) a holding tank for storing a quantity of the beverage at a selected temperature in a range between the higher

temperature and the lower temperature, having an inlet connected to the brew inlet and an outlet;

c) a hot reservoir for holding the beverage at a selected temperature at least as high as the higher temperature, having an inlet, an outlet, and a heater for maintaining beverage at the selected temperature;

d) a cold reservoir for holding the beverage at a selected temperature no higher than the lower temperature, having an inlet for accepting beverage, an outlet, and a heater for maintaining beverage at the selected temperature;

e) a cooler for lowering the temperature of a beverage, having an input connected to the outlet of the holding tank and an output connected to the inlet of the cold reservoir, such that hot beverage from the holding tank is cooled as it passes through the cooler to the cold reservoir;

f) a fluid heater for raising the temperature of a beverage, having an input connected to the outlet of the holding tank and an output connected to the inlet of the hot reservoir, such that hot beverage from the holding tank is heated as it passes through the heater to the cold reservoir;

g) a mixing valve having a first input connected to the outlet of the cold reservoir, a second input connected to the outlet of the hot reservoir, and an output producing a mixture of fluid from the first input and second input, the proportions of fluid in the mixture from the first input and the second input being controlled in response to the position of the mixing valve control; and

h) a vending valve having an input connected to the output of the mixing valve and an output for dispensing the beverage;

such that when the vending valve is opened, beverage is dispensed having a temperature determined by the position of the mixing valve control, mixing beverage from the hot reservoir and beverage from the cold reservoir.

11. The beverage machine of claim 10, further comprising a temperature display for showing the temperature of the beverage to be dispensed, comprising:

a) a first temperature sensor for measuring the temperature of the cold reservoir;

b) a second temperature sensor for measuring the temperature of the hot reservoir;

c) a valve position sensor coupled to the mixing valve, having an output which is proportional to the position of the mixing valve control;

d) a display for displaying a temperature;

e) a display control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the valve position sensor, and an output connected to the display,

the display control circuit reading the temperatures of the hot reservoir and cold reservoir through the first and second sensors, and the proportion of beverage dispensed from the reservoirs at the position of the mixing valve, and displaying on the display the temperature of the beverage which would be dispensed.

12. The beverage machine of claim 10, further comprising a dispensed beverage temperature control for selecting a dispensing temperature, comprising:

a) a first temperature sensor for measuring the temperature of the cold reservoir;

b) a second temperature sensor for measuring the temperature of the hot reservoir;

c) a valve position sensor coupled to the mixing valve, having an output which is proportional to the position of the mixing valve control;

d) a motor coupled to the mixing valve; and

e) a temperature control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the valve position sensor, and an output connected to the motor,

the temperature control circuit reading the temperatures of the hot reservoir and cold reservoir through the first and second sensors, and the proportion of beverage dispensed from the reservoirs at the position of the mixing valve, and driving the motor to turn the mixing valve to dispense beverage at the selected dispensing temperature.

13. The beverage machine of claim 12, further comprising a keypad connected to the temperature control circuit, such that the dispensing temperature is entered into the control circuit through the keypad.

14. The beverage machine of claim 12, further comprising a display connected to the control circuit, the control circuit displaying the selected dispensing temperature on the display.

15. The beverage machine of claim 10, in which the cooler comprises:

a) an outer tube having a first end connected to the outlet of the holding tank and a second end connected to the inlet of the cold reservoir;

b) a heat exchanger surrounding at least part of the outer tube;

c) an inner tube having closed ends, fitted coaxially inside the outer tube, leaving an annular gap between the inner tube and the outer tube;

d) a wire wound helically around the inner tube, substantially filling the annular gap between the inner tube and the outer tube, such that beverage flowing in the first end of the outer tube is guided helically around the inner tube through the annular gap to the second end of the outer tube.

16. The beverage machine of claim 15, in which the heat exchanger comprises tubes carrying cooled fluid.

17. The beverage machine of claim 16, in which the fluid is water.

18. The beverage machine of claim 15, in which the heat exchange comprises fins for air cooling on the outside tube, and a fan for moving air over the fins.

19. The beverage machine of claim 10, in which the fluid heater comprises:

a) an outer tube having a first end connected to the outlet of the holding tank and a second end connected to the inlet of the hot reservoir;

b) an external heater surrounding at least part of the outer tube;

c) an inner tube having closed ends, fitted coaxially inside the outer tube, leaving an annular gap between the inner tube and the outer tube;

d) a wire wound helically around the inner tube, substantially filling the annular gap between the inner tube and the outer tube, such that beverage flowing in the first end of the outer tube is guided helically around the inner tube through the annular gap to the second end of the outer tube.

20. The beverage machine of claim 19, in which the external heater comprises at least one electric heater which operates continuously.

21. The beverage machine of claim 19, in which the external heater comprises at least one electric heater which operates intermittently.

22. A method of dispensing a beverage at a selected temperature between a higher temperature and a lower temperature, comprising the steps of:

a) preparing the beverage;

b) holding a first quantity of the beverage in a hot reservoir at a temperature at least as high as the higher temperature;

c) holding a second quantity of the beverage in a cold reservoir at a temperature no higher than the lower temperature;

d) setting a mixing valve connected to the hot reservoir and the cold reservoir to mix a proportion of beverage from the hot reservoir and a proportion of beverage from the cold reservoir, the proportion being chosen such that a beverage mixed in the mixing valve will be at the selected temperature;

e) dispensing the beverage at the selected temperature from the mixing valve.

23. The method of claim 22, in which the step of preparing the beverage includes the step of holding the beverage in a holding tank for dispensing.

24. The method of claim 23, in which the step of preparing the beverage is done in a conventional coffee machine.

25. A beverage machine for dispensing hot beverages at a selected temperature in a range between a higher temperature and a lower temperature, comprising:

a) a holding tank for holding the beverage, having an outlet;

b) a hot reservoir for holding the beverage at a selected temperature no lower than the higher temperature, having an inlet for accepting beverage coupled to the outlet of the holding tank, an outlet, and a heater for maintaining beverage at the selected temperature;

c) a cold reservoir for holding the beverage at a selected temperature no higher than the lower temperature, having an inlet for accepting beverage coupled to the outlet of the holding tank, an outlet, and a heater for maintaining beverage at the selected temperature;

d) a mixing valve having a first input connected to the outlet of the cold reservoir, a second input connected to the outlet of the hot reservoir, and an output producing a mixture of fluid from the first input and second input, the proportions of fluid in the mixture from the first input and the second input being controlled in response to the position of the mixing valve control; and

f) a vending valve having an input connected to the output of the mixing valve and an output for dispensing the beverage;

such that when the vending valve is opened, beverage is dispensed having a temperature determined by the position of the mixing valve control, mixing beverage from the hot reservoir and beverage from the cold reservoir.

26. The beverage machine of claim 25 wherein the holding tank is portable.

27. The beverage machine of claim 25, further comprising a preheater having an inlet coupled to the outlet of the holding tank and an outlet coupled to the inlet of the cold reservoir and a volume much smaller than the cold reservoir, such that the beverage from the holding tank is quickly heated in the volume of the preheater before being introduced into the cold reservoir.

28. The beverage machine of claim 25, further comprising a preheater having an inlet coupled to the outlet of the holding tank and an outlet coupled to the inlet of the hot reservoir and a volume much smaller than the hot reservoir, such that the beverage from the holding tank is quickly heated in the volume of the preheater before being introduced into the hot reservoir.

29. The beverage machine of claim 25, further comprising a dispensed beverage temperature control for controlling a dispensing temperature at which the beverage is dispensed, comprising:

a) a temperature selector for inputting a dispensing temperature;

b) a first temperature sensor for measuring the temperature of the cold reservoir;

c) a second temperature sensor for measuring the temperature of the hot reservoir;

d) a motor coupled to the mixing valve; and

e) a temperature control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the temperature selector, and an output connected to the motor,

the temperature control circuit reading the temperatures of the cold reservoir and the hot reservoir through the first and second sensors, and the dispensing temperature from the temperature selector, and driving the motor to turn the mixing valve to dispense beverage at the selected dispensing temperature.

30. The beverage machine of claim 29, in which the temperature selector comprises a keypad connected to the temperature control circuit, such that the dispensing temperature is entered into the control circuit through the keypad.

31. The beverage machine of claim 30, in which the temperature selector further comprises a display connected

to the control circuit, the control circuit displaying the selected dispensing temperature on the display.

32. A beverage machine for dispensing hot beverages at a selected temperature in a range between a higher temperature and a lower temperature, comprising:

a) a holding tank for holding the beverage, having an outlet;

b) a hot reservoir for holding the beverage at a selected temperature no lower than the higher temperature, having an inlet for accepting beverage coupled to the outlet of the holding tank, an outlet, and a heater for maintaining beverage at the selected temperature;

c) a mixing valve having a first input connected to the outlet of the hot reservoir, a second input connected to the outlet of the holding tank, and an output producing a mixture of fluid from the first input and second input, the proportions of fluid in the mixture from the first input and the second input being controlled in response to the position of the mixing valve control; and

f) a vending valve having an input connected to the output of the mixing valve and an output for dispensing the beverage;

such that when the vending valve is opened, beverage is dispensed having a temperature determined by the position of the mixing valve control, mixing beverage from the hot reservoir and beverage from the holding tank.

33. The beverage machine of claim 32, in which the holding tank is portable.

34. The beverage machine of claim 32, further comprising a preheater having an inlet coupled to the outlet of the holding tank and an outlet coupled to the inlet of the hot reservoir and a volume much smaller than the hot reservoir, such that the beverage from the holding tank is quickly heated in the volume of the preheater before being introduced into the hot reservoir.

35. The beverage machine of claim 32, further comprising a dispensed beverage temperature control for controlling a dispensing temperature at which the beverage is dispensed, comprising:

a) a temperature selector for inputting a dispensing temperature;

b) a first temperature sensor for measuring the temperature of the holding tank;

c) a second temperature sensor for measuring the temperature of the hot reservoir;

d) a motor coupled to the mixing valve; and

e) a temperature control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the temperature selector, and an output connected to the motor,

the temperature control circuit reading the temperatures of the hot reservoir and holding tank through the second sensor and the first sensor, and the dispensing temperature from the temperature selector, and driving the motor to turn the mixing valve to dispense beverage at the selected dispensing temperature.

36. The beverage machine of claim 35, in which the temperature selector comprises a keypad connected to the temperature control circuit, such that the dispensing temperature is entered into the control circuit through the keypad.

37. The beverage machine of claim 35, in which the temperature selector further comprises a display connected to the control circuit, the control circuit displaying the selected dispensing temperature on the display.

38. A beverage machine for dispensing hot beverages at a selected temperature in a range between a higher temperature and a lower temperature, comprising:

a) a hot chamber for holding the beverage at a selected temperature no lower than the higher temperature, having an outlet;

b) a cold chamber for holding the beverage at a selected temperature no higher than the lower temperature, having an outlet;

c) a mixing valve having a first input connected to the outlet of the cold chamber, a second input connected to the outlet of the hot chamber, and an output producing a mixture of fluid from the first input and second input, the proportions of fluid in the mixture from the first input and the second input being controlled in response to the position of the mixing valve control; and

d) a vending valve having an input connected to the output of the mixing valve and an output for dispensing the beverage;

such that when the vending valve is opened, beverage is dispensed having a temperature determined by the position of the mixing valve control, mixing beverage from the hot chamber and beverage from the cold chamber.

39. The beverage machine of claim 38, in which the hot chamber and the cold chamber are part of a portable unit.

40. The beverage machine of claim 38, further comprising a dispensed beverage temperature control for controlling a dispensing temperature at which the beverage is dispensed, comprising:

a) a temperature selector for inputting a dispensing temperature;

b) a first temperature sensor for measuring the temperature of the cold chamber;

c) a second temperature sensor for measuring the temperature of the hot chamber;

d) a motor coupled to the mixing valve; and

e) a temperature control circuit, having a first input connected to the first sensor, a second input connected to the second sensor, a third input connected to the temperature selector, and an output connected to the motor,

the temperature control circuit reading the temperatures of the cold chamber and hot chamber through the first sensor and the second sensor, and the dispensing temperature from the temperature selector, and driving the motor to turn the mixing valve to dispense beverage at the selected dispensing temperature.

41. The beverage machine of claim 40, in which the temperature selector comprises a keypad connected to the

temperature control circuit, such that the dispensing temperature is entered into the control circuit through the keypad.

42. The beverage machine of claim 40, in which the temperature selector further comprises a display connected to the control circuit, the control circuit displaying the selected dispensing temperature on the display.

43. A method of dispensing a beverage at a selected temperature between a higher temperature and a lower temperature, comprising the steps of:

a) preparing the beverage at a brewing center;

b) cooling the beverage at a brewing center;

c) transferring the beverage to the service location in a portable holding tank;

d) at the service location, coupling the portable holding tank to a beverage dispensing machine having a hot reservoir and a cold reservoir;

e) holding a first quantity of the beverage in a hot reservoir at a temperature at least as high as the higher temperature;

f) holding a second quantity of the beverage in a cold reservoir at a temperature no higher than the lower temperature;

g) setting a mixing valve connected to the hot reservoir and the cold reservoir to mix a proportion of beverage from the hot reservoir and a proportion of beverage from the cold reservoir, the proportion being chosen such that a beverage mixed in the mixing valve will be at the selected temperature;

h) dispensing the beverage at the selected temperature from the mixing valve.

44. A method of dispensing a beverage at a selected temperature between a higher temperature and a lower temperature, comprising the steps of:

a) preparing the beverage at a brewing center and transferring a portion of the beverage to a hot chamber;

b) cooling a portion of the beverage at the brewing center and transferring the portion of the beverage which was cooled to a cold chamber;

d) at a service location, coupling the hot chamber and the cold chamber to a beverage dispensing machine having a mixing valve coupled to the hot chamber and the cold chamber;

e) setting the mixing valve to mix a proportion of beverage from the hot chamber and a proportion of beverage from the cold chamber, the proportion being chosen such that a beverage mixed in the mixing valve will be at the selected temperature;

f) dispensing the beverage at the selected temperature from the mixing valve.

45. The method of claim 44 in which the hot chamber and the cold chamber are part of a portable holding tank.

* * * * *

EXHIBIT F

US006283625B2

(12) **United States Patent**
Frankel et al.

(10) **Patent No.: US 6,283,625 B2**
(45) **Date of Patent: Sep. 4, 2001**

(54) **APPARATUS TO HEAT AND FROTH MILK UTILIZING COUNTER ROTATING MESH TABS PADDLES**

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(73) Assignee: **Stephen W. Frankel**, Palos Verdes, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/352,377**

(22) Filed: **Jul. 13, 1999**

(51) **Int. Cl.**[7] **A47J 43/046**; B01F 3/04; B01F 7/20

(52) **U.S. Cl.** **366/146**; 366/205; 366/206; 366/296; 366/309; 366/314; 366/325.93; 366/328.2; 366/601

(58) **Field of Search** 366/146, 205, 366/206, 293, 294, 295, 296, 314, 325.93, 328.2, 328.3, 328.4, 601, 67, 309, 145; 99/348

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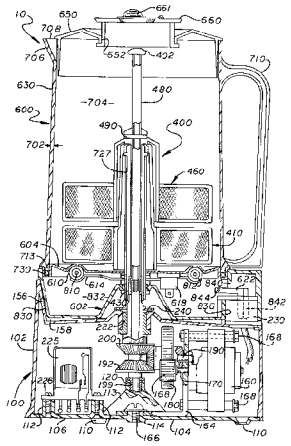
Primary Examiner—Charles E. Cooley
(74) *Attorney, Agent, or Firm*—Blakely Sokoloff Taylor & Zafman

(57) **ABSTRACT**

The invention includes an apparatus to automatically heat and froth milk for beverages. The apparatus includes a container, a lower paddle group and upper paddle group located above the container bottom. Each paddle group includes at least two paddles. The lower paddle group is adapted to rotate in a direction that is counter to the rotation of the upper paddle group. The apparatus further includes a heater disposed firmly against and below the container bottom.

25 Claims, 10 Drawing Sheets



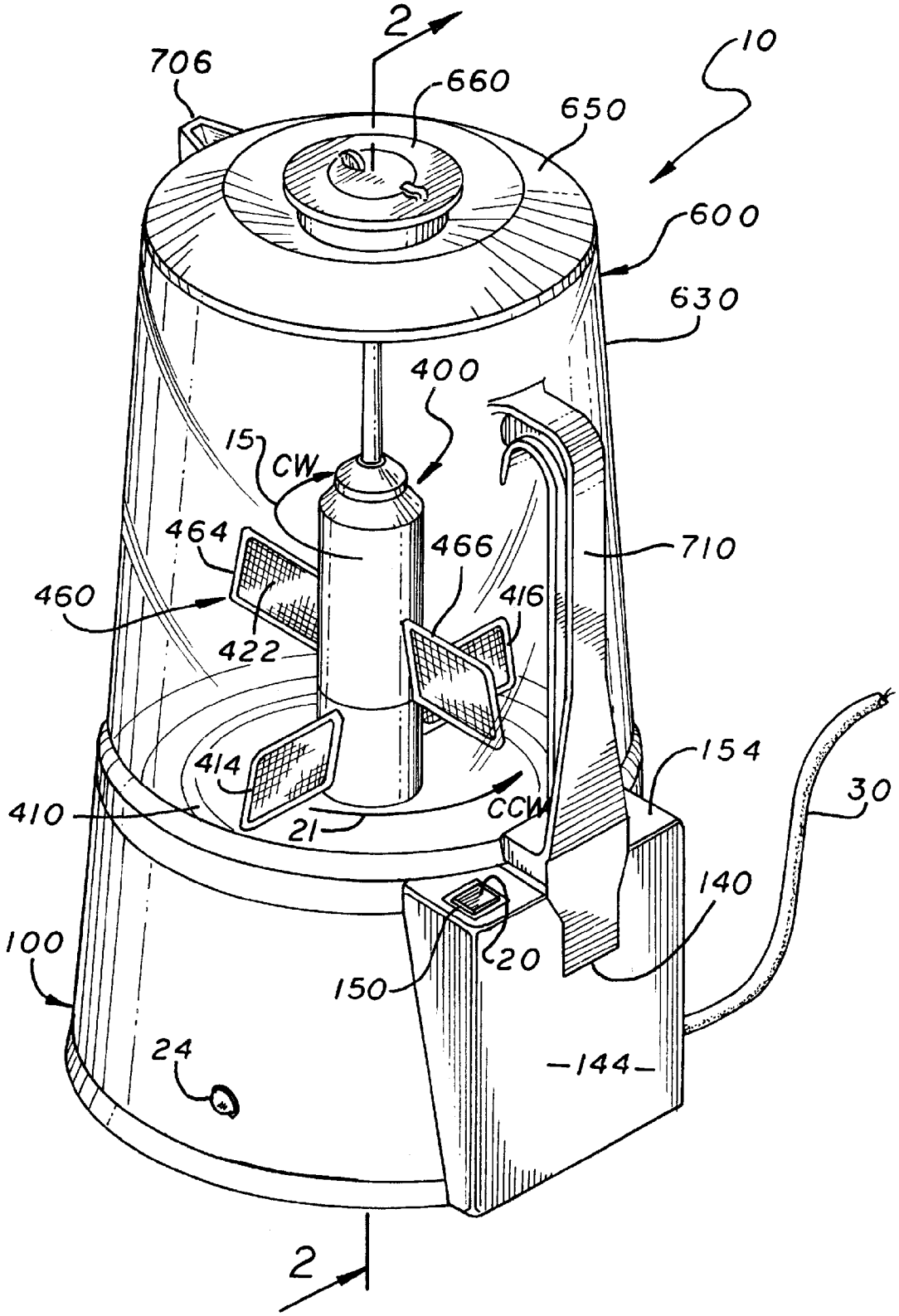

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FIG. 1

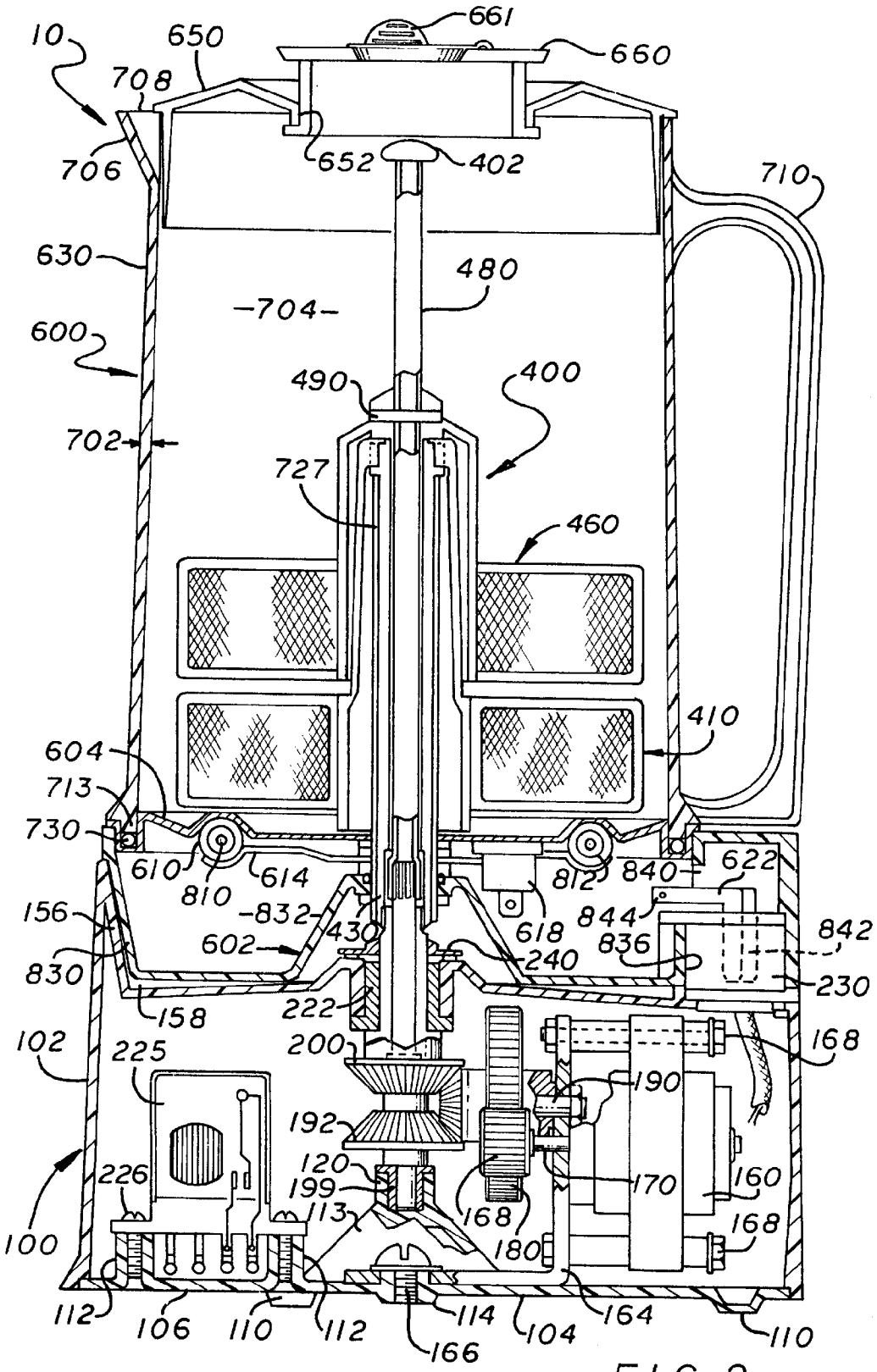
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FIG. 2

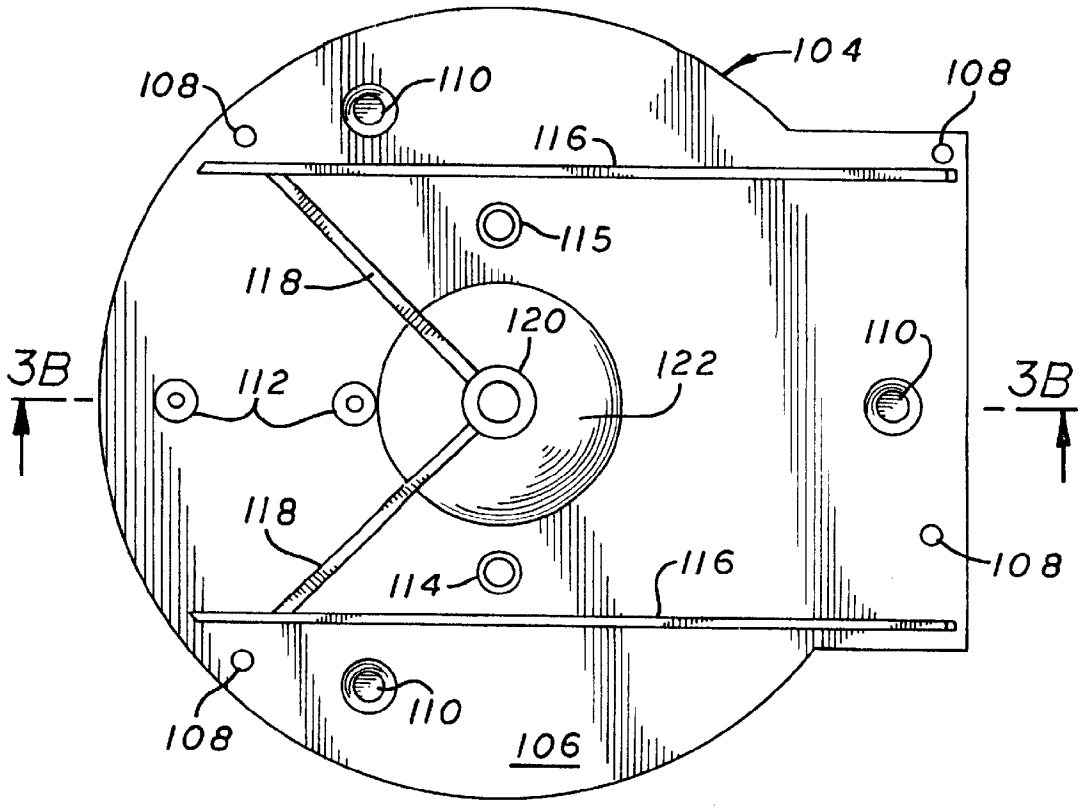
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FIG. 3A

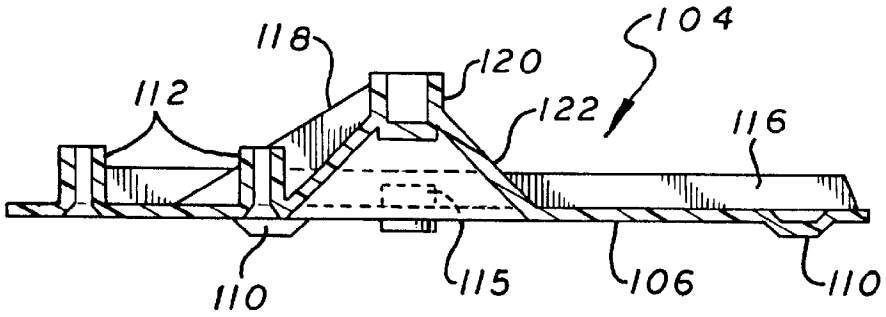
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FIG. 3B

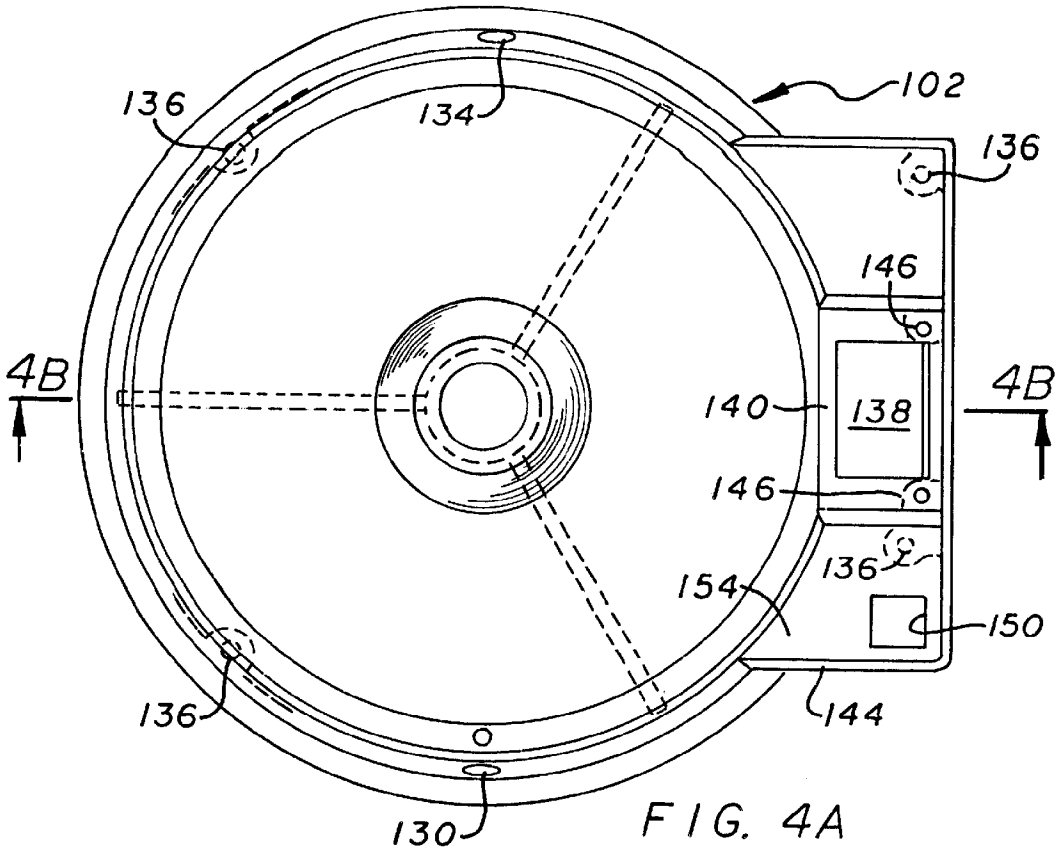
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FIG. 4A

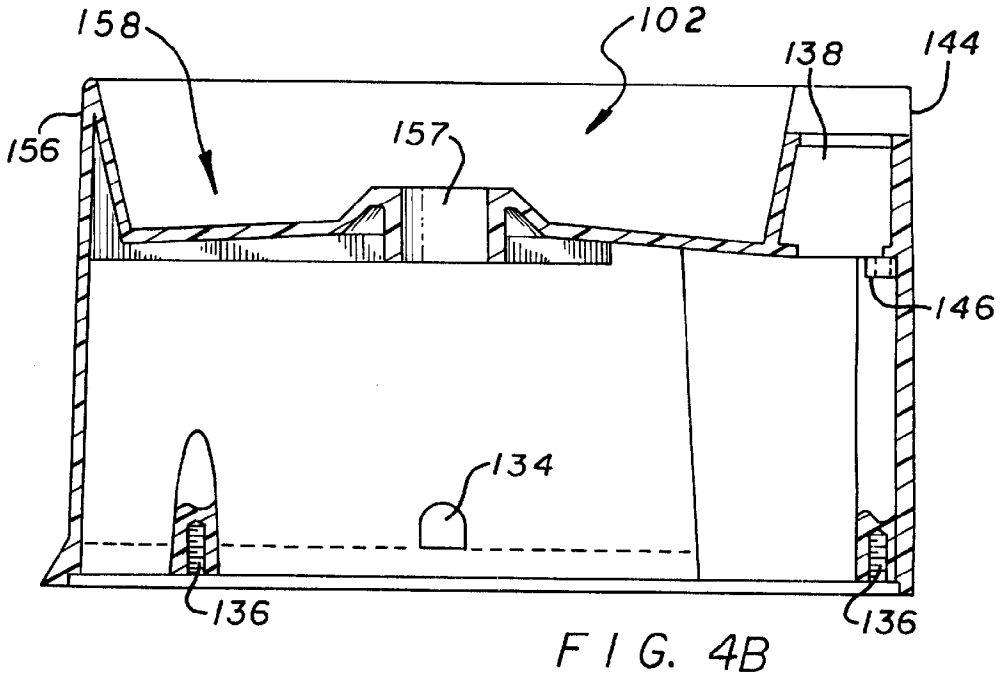
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FIG. 4B

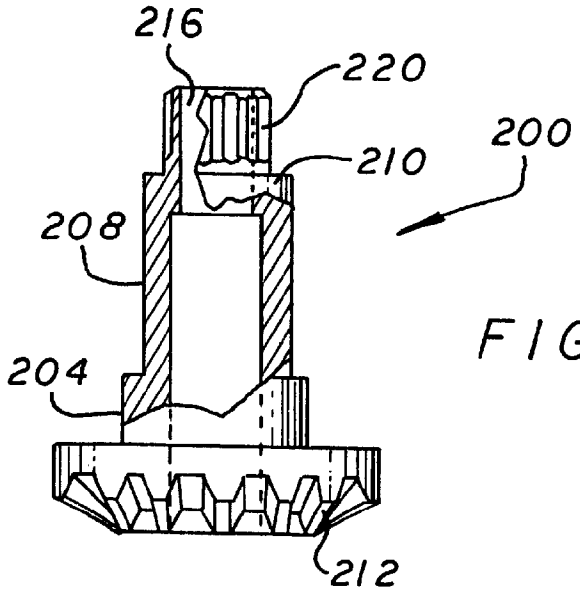

FIG. 7

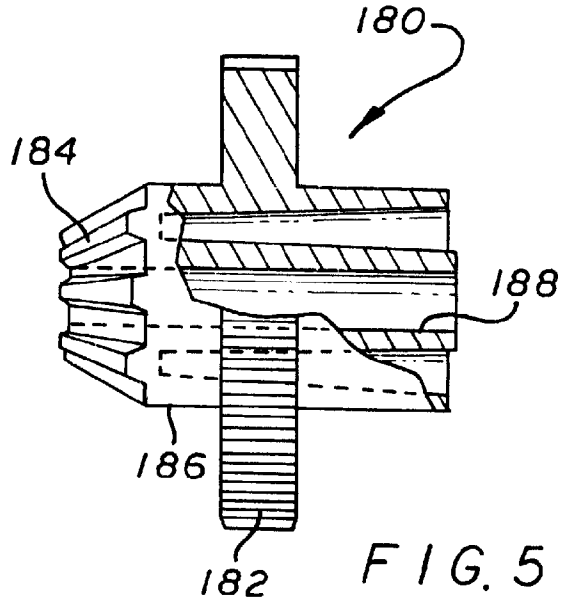

FIG. 5

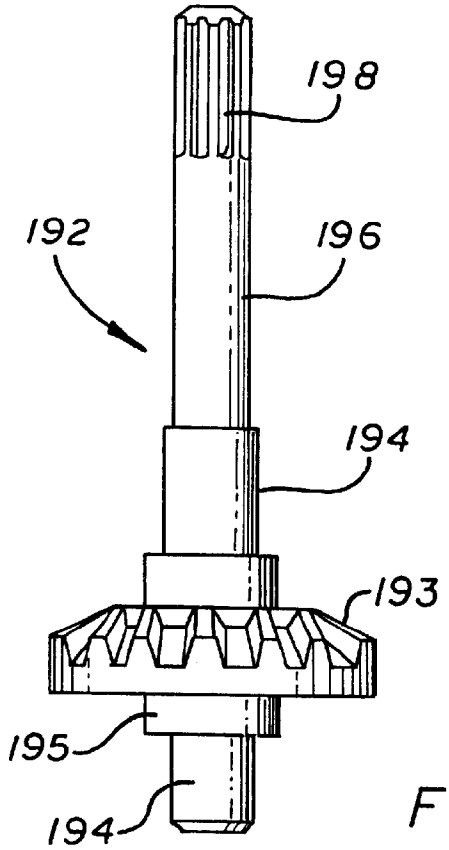

FIG. 6

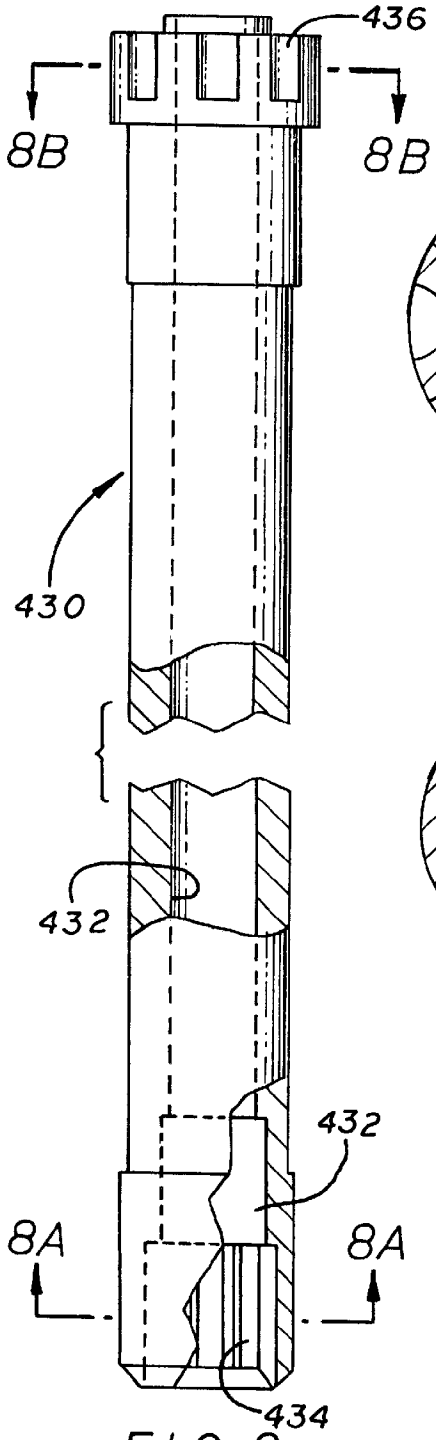

FIG. 8

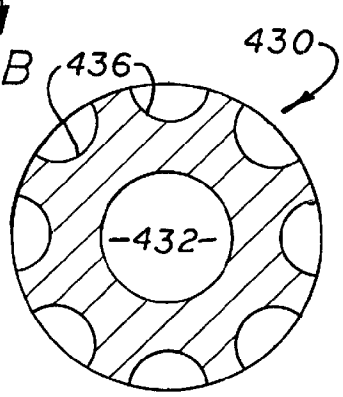

FIG. 8B

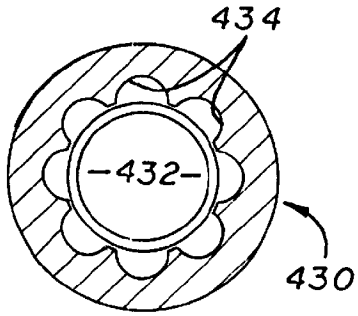

FIG. 8A

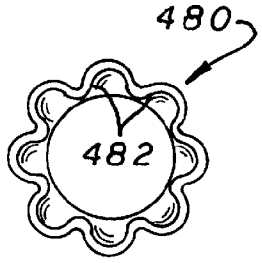

FIG. 9A

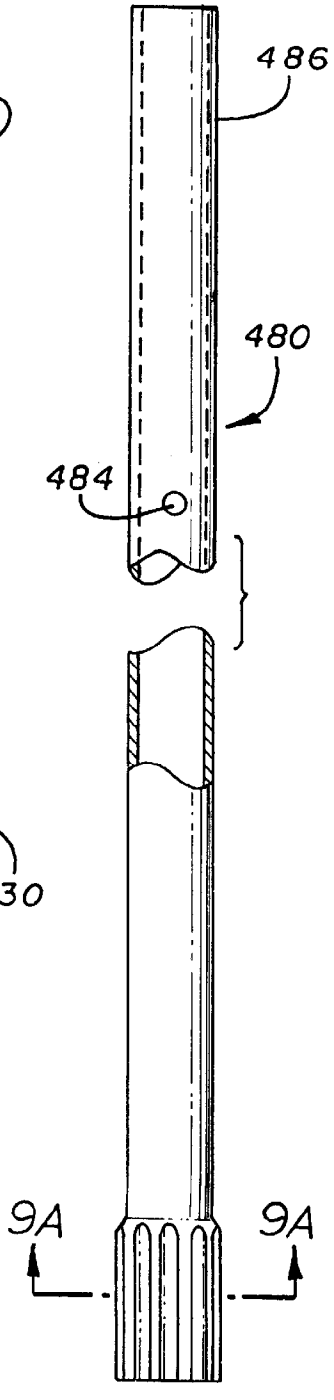

FIG. 9

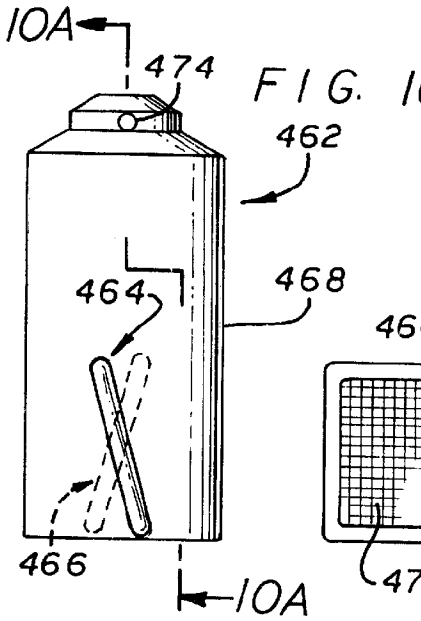

FIG. 10

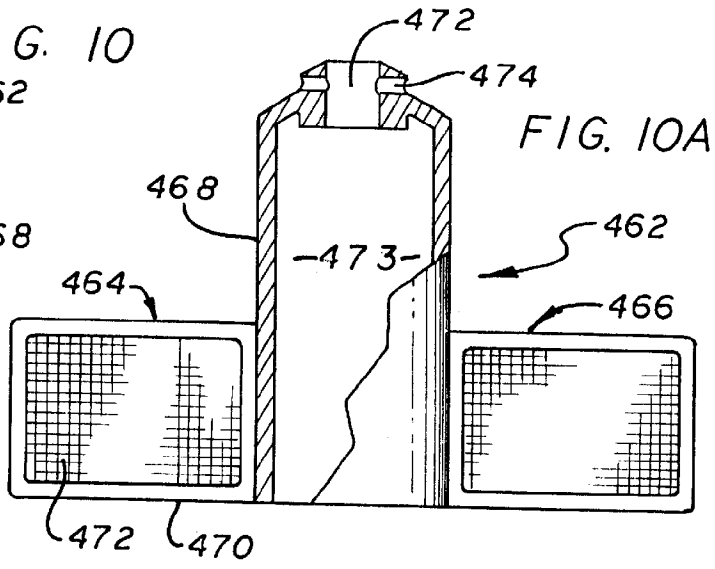

FIG. 10A

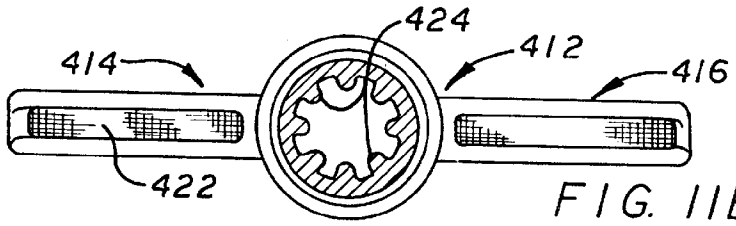

FIG. 11B

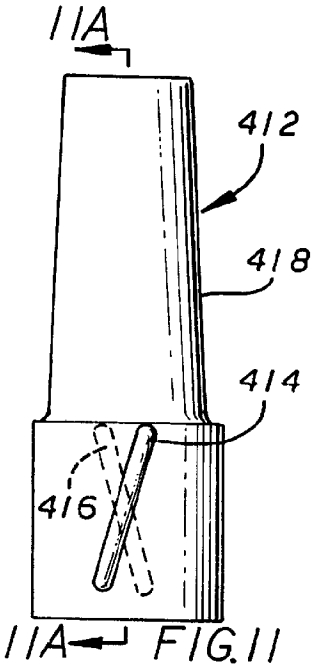

FIG. 11

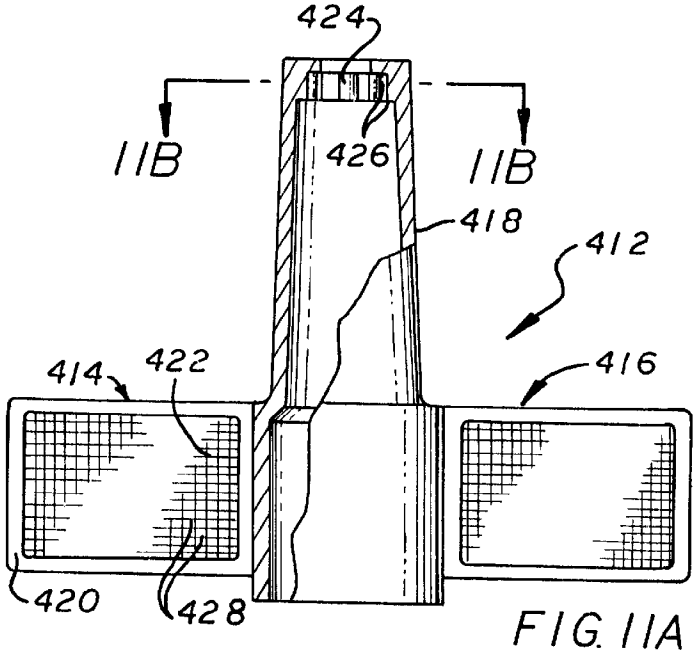

FIG. 11A

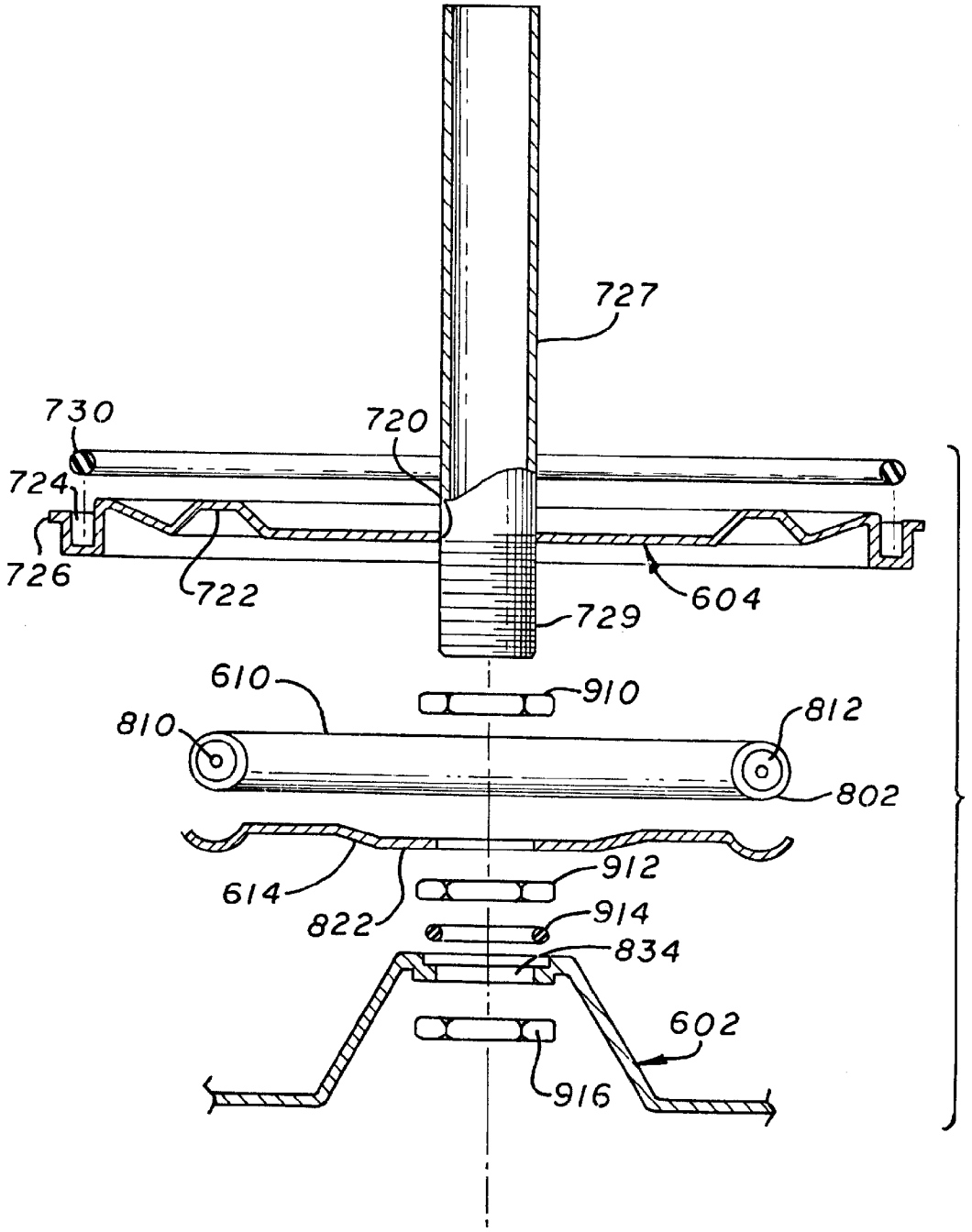
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FIG. 12

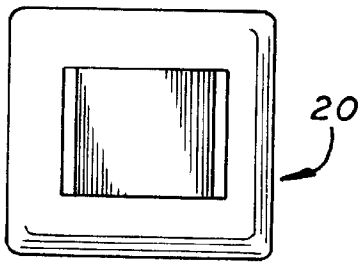

FIG. 13A

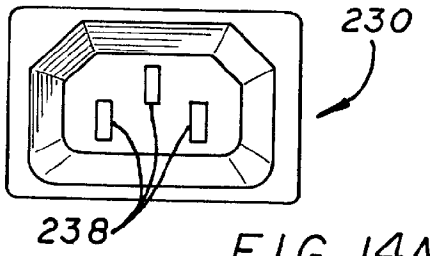

FIG. 14A

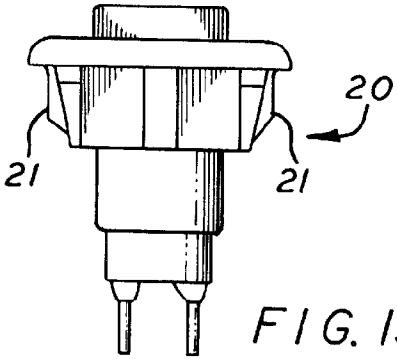

FIG. 13B

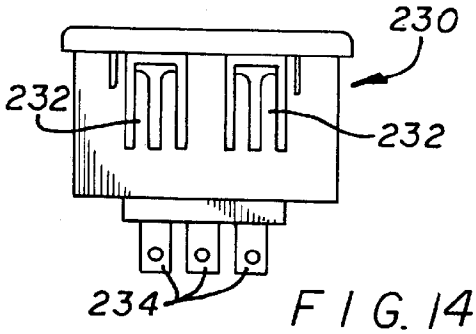

FIG. 14B

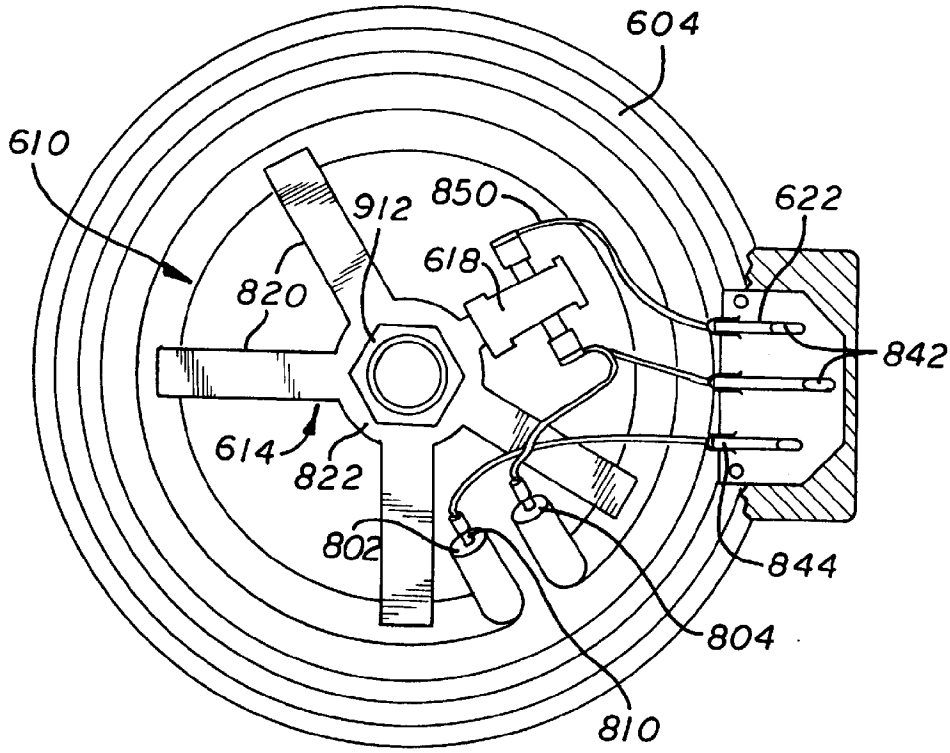

FIG. 15

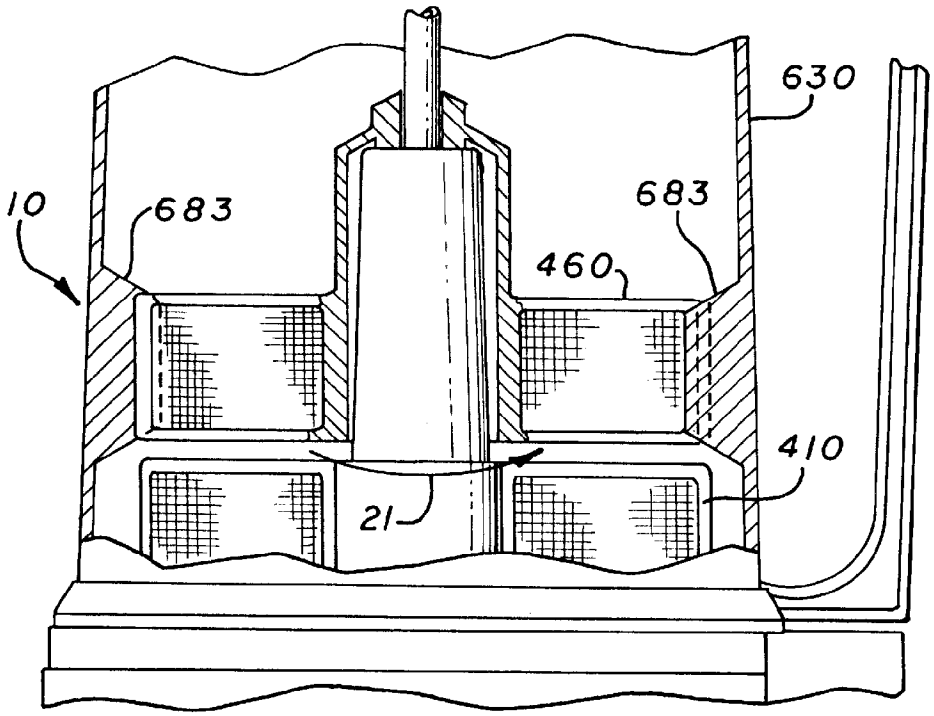

FIG. 16

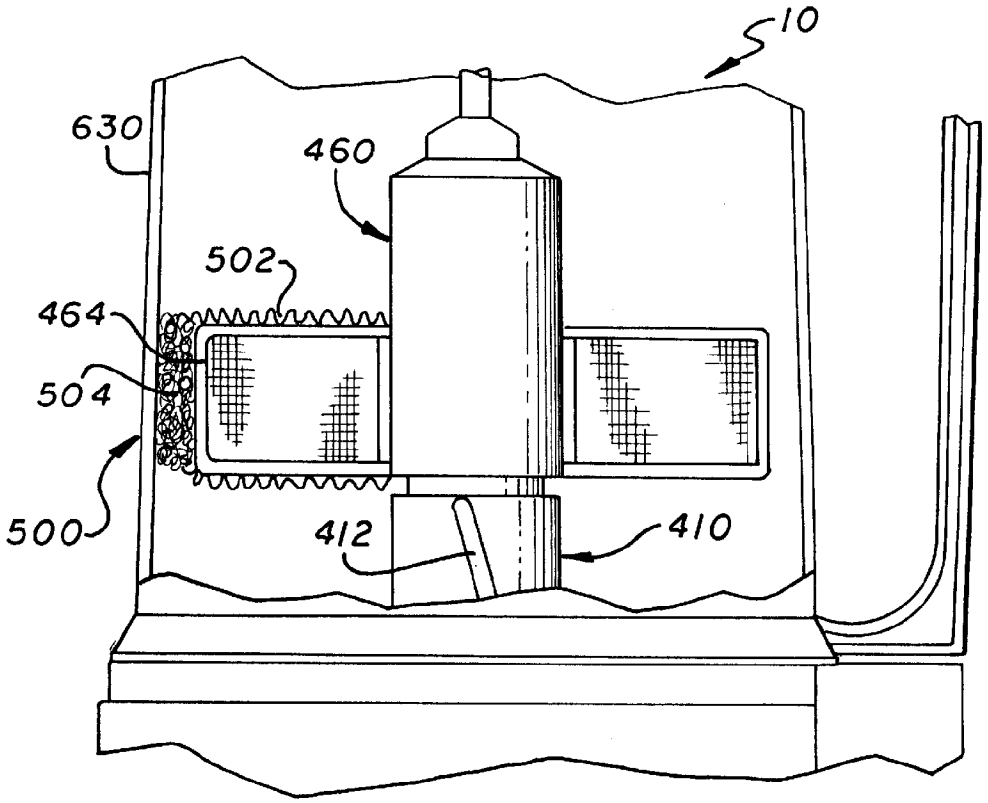

FIG. 17

APPARATUS TO HEAT AND FROTH MILK UTILIZING COUNTER ROTATING MESH TABS PADDLES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to foaming or frothing a beverage such as milk for espresso type coffee drinks, hot chocolate, and the like by counter rotating paddles immersed within the milk where the paddles principally are formed of a screen or mesh.

2. Background Information

Espresso is strong coffee brewed by forcing steam under pressure through darkly roasted, finely ground coffee beans. This form of brewing can produce a thin layer of creamy, dark beige froth on the coffee's surface. Because Espresso is so strong, this rich, complex flavored beverage is served in a small two to three ounce cup known as a demitasse.

To quell the strong taste, some who partake in espresso add sugar. Alternatively, the espresso coffee may be mixed or topped with steamed milk or cream to form espresso based beverages such as cappuccinos, lattes, mochas and the like. The steamed milk forms a froth that adds flavor and texture to the espresso coffee as well as serves as a garnish. Espresso is popular in Europe whereas cappuccino and lattes have become popular in the United States.

Conventionally, the milk for espresso based beverages is warmed and frothed through superheated water vapors maintained at high pressure. A variety of machines have been patented, most seeking to overcome the inconsistent nature of steaming milk. See, for example, U.S. Pat. Nos. 4,960,042, 5,335,588, 5,423,245, 5,464,574, 5,738,002, and 5,862,740.

Generally, each steam producing espresso machine has a cavity in which water is turned to steam and placed under pressure. A valve-controlled steam wand is coupled to the cavity at one end and has a venturi jet at the other end. The wand extends from the machine and into a cup of milk. As the valve opens, the compressed steam expands as both water vapor and air into the milk. This rapidly raises the temperature of the fats in the milk and causes the milk to foam. The problem with this technique is that the water undesirably modifies the taste of the froth milk. Moreover, the quality of frothed milk is inconsistent from one application to another application.

There exists techniques to whip milk into a warm froth without the addition of hot water vapors. One technique is to direct the milk into a hard surface, thus causing the milk to rapidly change directions so as to expand into a froth. For example, U.S. Pat. No. 4,537,323 relates to an impeller having low vertical profile blade disposed within dairy based drinks where the impeller is driven at 4,000 Revolutions Per Minute (RPM) by external magnets. The high speed and low vertical profile of these blades forces the milk to rapidly change directions into surrounding air so as to produce fine, uniform bubbles within the milk. As another example, the device of U.S. Pat. No. 4,620,953 first heats milk through a heat exchanger and directs the hot milk through an adjustable-gap venturi into a stationary hole partially filled by cone. The cone provides an impact surface on which the milk impacts and rapidly changes direction. U.S. Pat. Nos. 4,949,631 and 5,759,604 operate similarly.

A technique to control a froth within a liquid without the addition of hot water vapors is to pass the liquid through stationary screens. For example, U.S. Pat. No. 5,151,199 teaches passing instant coffee through stationary screens to reduce the bubbles formed in instant coffee from large coarse bubbles to bubbles that comprise a fine, creamy froth. U.S. Pat. No. 5,738,002 teaches passing milk through a stationary frother nozzle having a plurality of holes that serve to aerate and cause frothing of the milk passing therethrough.

Another technique to whip milk into a warm froth without the addition of hot water vapors is to manually move coils, screens or meshes in a random or vertical direction through the milk. For example, U.S. Pat. No. 5,482,367 teaches manually rotating toroidal coils having a diameter range of 17 mm to 19 mm through milk using a hand whipping motion, much like hand beating eggs. U.S. Pat. Nos. 5,580, 169 and 5,780,087 each teach manually passing a screen attached to a plunger through milk in a vertical reciprocating motion. Each of the above mixtures may be pre-heated in a microwave oven.

For follow up reading, see Mathew Tekulsky et al., *Making Your Own Gourmet Coffee Drinks: Espressos, Cappuccinos, Lattes, Mochas, and More*! (Crown Pub., January 1993); *Espresso Coffee: The Chemistry of Quality* (Andrea Illy & Rinantonio Viani Eds., Academic Pr., October 1995); David C. Schomer, *Espresso Coffee: Professional Techniques* (Peanut Butter Pub., June 1996); Howard Schultz & Dori Jones Yang, *Pour Your Heart into It: How Starbucks Built a Company One Cup at a Time* (Hyperion, September 1997); Phillip Janssen, *Espresso Quick Reference Guide* (Eightball Books, September 1998); and Christie Katona & Thomas Katona, *Cappuccino/Espresso: The Book of Beverages* (Bristol Pub. Enterprises, March 1999).

SUMMARY OF THE INVENTION

The invention relates to an automatic beverage frother. The beverage frother includes a lower housing assembly having a motor coupled to a gear train. The gear train may be removeably coupled to an upper paddle group and a lower paddle group disposed within a container. Each paddle group rotates about the longitudinal axis of the container in opposite directions. Within each paddle group is at least one paddle where each paddle is formed of a frame having a mesh disposed within the frame. Other embodiments are disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an isometric view of frother **10** showing housing assembly **100** supporting container assembly **600** and having impeller assembly **400** disposed therewithin;

FIG. **2** is a section view of frother **10** taken off of line **2**—**2** of FIG. **1**;

FIG. **3**A is a top view of system bottom **104** of housing assembly **100** shown in FIG. **2**;

FIG. **3**B is a side section view of system bottom **104** taken generally off of line **3**B—**3**B of FIG. **3**A;

FIG. **4**A is a top view of systems housing **102** seen in FIG. **2**;

FIG. **4**B is a side section view of systems housing **102** taken generally off of line **4**B—**4**B of FIG. **4**A;

FIG. **5** illustrates the details of dual gear **180**;

FIG. **6** illustrates upper paddle group drive **192**;

FIG. **7** illustrates lower paddle group drive **200**;

FIG. **8** illustrates lower drive tube **430**;

FIG. **8**A is a section view of internal pockets **434** taken off of line **8**A—**8**A of FIG. **8**;

FIG. **8**B is a section view of external pockets **436** taken off of line **8**B—**8**B of FIG. **8**;

FIG. **9** illustrates upper drive tube **480**;

FIG. **9**A is a section view of internal pockets **482** taken off of line **9**A—**9**A of FIG. **9**;

FIG. **10** is a side view of upper impeller **462**;

FIG. **10**A is a sectional side view of upper impeller **462** taken generally off of line **10**A—**10**A of FIG. **10**;

FIG. **11** illustrates a side view of lower drive tube **430**;

FIG. **11**A is a sectional side view of lower impeller **412** taken generally off of line **11**A—**11**A of FIG. **11**;

FIG. **11**B is a top view of lower impeller **412** taken generally off of line **11**B—**11**B of FIG. **11**A;

FIG. **12** illustrates a partial assembly of container assembly **600**;

FIG. **13**A is a top view of push button switch **20**;

FIG. **13**B is a side view of push button switch **20**, showing snap fits **21**;

FIG. **14**A is a top view of female connector **230**, showing sockets **238**;

FIG. **14**B is a side view of female connector **230**, showing mounting pegs **232** and terminals **234**;

FIG. **15** illustrates the mechanical support and the wiring of heater **610** and automatic switch **618**;

FIG. **16** is an isometric view of frother **10** showing upper paddle group **460** kept stationary as lower paddle group **410** rotates in the direction of arrow **21**; and

FIG. **17** illustrates that seal **500** may be comprised of coil spring **502** secured to lead paddle **464** and mesh screen **504**.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, numerous specific details are set forth such as specific materials, processing steps, processing parameters, etc., in order to provide a thorough understanding of the invention. One skilled in the art will recognize that these details need not be specifically adhered to in order to practice the claimed invention. In other instances, well known processing steps, materials, etc., are not set forth in order not to obscure the invention. A patent need not teach, and preferably omits, what is well known in the art.

FIG. **1** is an isometric view of frother **10** showing housing assembly **100** supporting container assembly **600** and having impeller assembly **400** disposed therewithin. In the preferred embodiment, liquid to be mixed (not shown) is added into container **630** and pushbutton switch **20** is activated such that light bulb **24** glows red. The red glow of light bulb **24** indicates that power is supplied through power cord **30** to heater **610** (FIG. **2**) and motor **160** (FIG. **2**) so that the liquid is heated and agitated.

Preferably, lower paddle group **410** of impeller assembly **400** moves counter clockwise as shown in FIG. 1 by arrow **21** while upper paddle group **460** moves clockwise as shown by arrow **15**. As lower paddle group **410** moves counter clockwise, the liquid is forced radailly outward and up the inside surface of container **630**. Under power, lower lead paddle **414** and lower follow paddle **416** attempt to form a parabola out of the mixing liquid through their rotation and angular orientation. As this occurs, the opposite-rotating, upper lead paddle **464** and upper follow paddle **466** force the liquid rising along the inside surface of container **630** back down into the rotating lower paddle group **410**. This works to compel the liquid and each mesh **422** through one another so as to quickly generate a very warm, rich, thick, beautiful froth. It is this froth that may be used in drinks such as espresso based beverages, other coffee based beverages, and chocolate based beverages such as hot chocolate. The use of froth made from various liquids is a function of the application as well as the user's imagination.

FIG. **2** is a section view of frother **10** taken off of line **2**—**2** of FIG. **1**. In operation, container assembly **600** may be physically detached from systems housing **102** at the location where heater housing **602** joins systems housing **102**. By lifting up on handle **710** of container assembly **600**, container assembly **600** is separated from systems housing **102**. Along with system bottom **104**, systems housing **102** encloses the mechanical and electrical systems support for frother **10**. In one embodiment, container assembly **600** is fixed to lower housing assembly **100** such that lifting up on handle **710** of container assembly **600** raises container assembly **600** and systems housing **102**.

FIG. **3**A is a top view of system bottom **104** of housing assembly **100** shown in FIG. **2**. FIG. **3**B is a side section view of system bottom **104** taken generally off of line **3**B—**3**B of FIG. **3**A. As seen in FIG. **3**A and FIG. **3**B, system bottom **104** has a variety of features molded into its shape on which to mount the mechanical and electrical components of frother **10**. Base **106** serves to support each of these features. Four housing holes **108** are formed into base **106**, each of which aids in mounting systems housing **102** (FIG. **4**B) to base **106**.

Extending below base **106** is foot **110**. Each foot **110** works to stabilize frother **10**. Preferably, there are three of foot **110** as seen in FIG. **3**A. Extending above base **106** are relay bosses **112**, bracket bosses **114** and **115**, ribs **116**, gussets **118**, impeller boss **120**, and cone **122**. Ribs **116** extend along the long length of base **106** so as to help maintain the preferred flat shape of base **106**. Cone **122** serves as a stable base on which to raise impeller boss **120**. The primary function of impeller boss **120** is to keep impeller assembly **400** from moving in a horizontal direction. To add further structural support to impeller boss **120**, two gussets **118** extend from impeller boss **120** along cone **122** to base **106**. In FIG. **3**B, bracket boss **115** is revealed in phantom lines behind cone **122**.

FIG. **4**A is a top view of systems housing **102** seen in FIG. **2**. FIG. **4**B is a side section view of systems housing **102** taken generally off of line **4**B—**4**B of FIG. **4**A. As seen in FIG. **4**B, systems housing **102** is vertically elongated. This provides space for systems support such as mechanical and electrical components. Systems housing **102** also maintains access and mounting features.

Power cord hole **134** is formed into the location that is the polar opposite of light hole **130**. Light hole **130** may receive light bulb **24** (FIG. **1**) whereas power cord hole **134** provides a through access for power cord **30** (FIG. 1). Blind holes **136** of FIG. **4**A and FIG. **4**B aid in mounting system bottom **104** to systems housing **102** by receiving into the cavity of each blind hole **136**, a thread forming screw that passes through a complementary housing hole **108** of system bottom **104**.

Since heater **610** (FIG. **2**) of container assembly **600** and its associated automatic switch **618** preferably detach from lower housing assembly **100** as container assembly **600** is lifted from lower housing assembly **100**, mounting cutout **138** of FIG. **4**A is formed into recessed portion **140** of block **144** to provide a location in which to place female connector **230** (FIG. **2**, FIG. **14**A, and FIG. **14**B). Two peg bosses **146** of FIG. **4**A aid in securing female connector **230** to systems housing **102**. Other features of systems housing **102** include

switch aperture **150**, extension **156**, and pipe **157**. Switch aperture **150** is formed through the material supporting top surface **154** of block **144** whereas extension **156** forms container well **158**. Pipe **157** permits the gear train of frother **10** to extend between systems housing **102**. As shown in FIG. **2**, upper bearing **222** may be press fit into pipe **157**.

Referring back to FIG. **2**, a variety of electrical and mechanical components are shown. Contained within systems housing **102** are motor **160**, bracket **164**, drive pinion **168**, dual gear **180**, upper paddle group drive **192**, lower paddle group drive **200**, relay **225**, and female connector **230**. As shown in FIG. **2**, relay **225** may be mounted to relay bosses **112** with screws **226** at a position adjacent to lower paddle group drive **200**. Relay **225** may be any device that responds to a small current or voltage change by activating switches or other devices in an electric circuit. Except for female connector **230**, each of these components preferably are connected with system bottom **104**.

To attach motor **160** to system bottom **104**, an L-shaped bracket, such as bracket **164**, is employed. Bracket **164** has two prongs that extend around cone **122** (FIG. **3**A) of system bottom **104** so that each prong extends one through hole over complementary bracket boss **114** and one through hole over complementary bracket boss **115**. Screws **166** (FIG. **2**) are then inserted and tightened into bracket bosses **114** and **115**. Motor **160** may be attached to bracket **164** by known hardware such as screws and spacers **168**. Motor **160** may be a 2.5 inch diameter C-frame (shaded-Pole), 3000 RPM, 2 pole, Fasco Type 02, 1/400 to 1/25 horse power motor manufactured by Fasco Motors Group, St. Louis, Mo. Shaft **170** extends from motor **160** and rotates upon power being supplied to motor **160**.

The rotation of shaft **170** may be transmitted to the paddles of frother **10** through a gear train. Drive pinion **168** is attached to shaft **170** to provide tooth-to-tooth transfer of power to dual gear **180**. As shaft **170** rotates, so does drive pinion **168** and dual gear **180**.

Drive pinion **168** may be thought of as a small cogwheel that engages a larger cogwheel. In this case, the larger cogwheel is driver gear **182** that forms part of dual gear **180**. FIG. **5** illustrates the details of dual gear **180**.

As shown in FIG. **5**, dual gear **180** has two gears: driver gear **182** and bevel gear **184**. Both driver gear **182** and bevel gear **184** are attached to shaft **186**, where shaft **186** forms interior cavity **188** about the longitudinal axis of shaft **186**. Driver gear **182** has a cylindrical profile that meshes with the smaller cylindrical profile of drive pinion **168**. Bevel gear **184** is preferably a conical gear, that is to say, a gear in the shape of a cone. The conical shape of bevel gear **184** is preferred since this permits counter rotations at ninety degrees to shaft **186** of dual gear **180** within a confined space.

Dual gear **180** not only needs to be mounted in relation to drive pinion **168**, but mounted so as to be freely subject to the rotation of drive pinion **168**. To accomplish this rotation, dual gear bearing **190** (FIG. **2**) first is attached to bracket **164**. Cavity **188** of dual gear **180** is then inserted over dual gear bearing **190** such that driver gear **182** meshes with drive pinion **168** as shown in FIG. **2**.

Alternatively, lower impeller group **410** may be coupled to a motor where the rotational direction of the motor is changed after developing a liquid parabola so as to force the impeller through the parabola. This change may be made by a manual switch or made through a computer chip coupled to motor and programmed to change the motor directions either as a function of time, as a function of pressure against lower impeller group **410**, or both. Experiments have shown that a less than ten second motor reverse time is too soon and more than a forty second motor reverse time is too long to create good froth. Thus, the rotational direction of the motor may be reversed at a point within each sequential time interval of ten and forty seconds. If the rotational direction were reversed after twelve seconds, the rotational direction of the motor may again be reversed at a point within the subsequent time interval of ten and forty seconds. Preferably, the motor direction is changed every twenty seconds.

The above described gear train is a preferred embodiment. However, the claims of this patent are not limited to the described gear train, but include any structure that translates electricity into rotation motion about a vertical axis. For example, the product CoCoMotion manufactured as model HC4 by Mr. Coffee of Cleveland, Ohio includes two opposing, low profile nubs fixed to one another and located at the base of a container where the nubs are driven about the longitudinal axis of the container by electrically powered magnets to make hot cocoa.

FIG. **6** illustrates upper paddle group drive **192**. With dual gear **180** mounted in place, upper paddle group drive **192** may be installed. Shafts **194**, **195**, and **196** of upper paddle group drive **192** are concentric to one another and elongate upper paddle group drive **192** at various radial diameters. Gear drive **193** is fastened onto shaft **195**, the largest diameter of the shafts. Gear drive **193** is a straight bevel gear whose teeth are arranged to mesh with the teeth of bevel gear **184** that is maintained as part of dual gear **180** (FIG. **5**). At the end of shaft **196** of FIG. **6** is external gear **198**. External gear **198** is an elongated gear whose teeth are directed radially outward from the longitudinal axis of upper paddle group drive **192**. Preferably, upper paddle group drive **192** is made from a molded plastic such as delrin.

To install upper paddle group drive **192**, lower bearing **199** of FIG. **2** is press fit into impeller boss **120**. Shaft **194** of upper paddle group drive **192** may then be arranged into lower bearing **199** so that the teeth of gear drive **193** (FIG. **6**) mesh with the teeth of bevel gear **184** (FIG. **5**). Preferably made of a polytetrafloroethylene based plastic, lower bearing **199** stabilizes the orbit of upper paddle group drive **192** while minimizing the friction between these two elements.

In part, upper paddle group drive **192** preferably resides concentric to, and coaxial with, lower paddle group drive **200**. FIG. **7** illustrates lower paddle group drive **200**. Shafts **204**, **208**, and **210** of lower paddle group drive **200** are concentric to one another and elongate lower paddle group drive **200** at various radial diameters. Gear drive **212** is fastened onto shaft **204**, the widest diameter of the shafts. Gear drive **212** is a straight bevel gear whose teeth are arranged to mesh with the teeth of bevel gear **184** that is maintained as part of dual gear **180** (FIG. **5**). At the end of shaft **210** is external gear **220**. External gear **220** is an elongated gear whose teeth are directed radially outward from the axis of lower paddle group drive **200**. Bored through lower paddle group drive **200** is lumen **216**. Lumen **216** is a hollow shaft whose internal diameter is greater than the diameter of shaft **196** of upper paddle group drive **192**. Preferably, lower paddle group drive **200** is made from a molded plastic such as nylon. To install lower paddle group drive **200**, lumen **216** is placed about shaft **196** of upper paddle group drive **192** so that the teeth of gear drive **212** mesh with the teeth of bevel gear **184**.

Upper paddle group drive **192** is responsible for rotating upper paddle group **460** in the clockwise direction while

lower paddle group drive **200** is responsible for rotating lower paddle group **410** in the counter clockwise direction. By positioning gear drive **193** and gear drive **212** at each end of a diameter of bevel gear **184**, both upper paddle group drive **192** and lower paddle group drive **200** rotate at similar revolutions per minute but in opposite directions. These counter rotations are translated to paddle groups **460** and **410** so that paddle groups **460** and **410** rotate in opposite directions.

Preferably, upper paddle group **460** and lower paddle group **410** rotate about the longitudinal axis of container **630** along a circular path. This path may be other than circular, such as elliptical or random. Moreover, the path may vary out of plane and in each vertical direction.

To couple the rotation of upper paddle group drive **192** and lower paddle group drive **200** to their respective paddle groups, extension tubes are preferably employed. FIG. **8** illustrates lower drive tube **430** and FIG. **9** illustrates upper drive tube **480**. Lower drive tube **430** of FIG. **8** includes hollow portion **432**, internal pockets **434**, and external pockets **436**.

Hollow portion **432** permits mechanical coupling of upper paddle group drive **192** (FIG. **2**) to upper paddle group **460** through upper drive tube **480** of FIG. **9**. FIG. **8**A is a section view of internal pockets **434** taken off of line A—A of FIG. **8** and FIG. **8**B is a section view of external pockets **436** taken off of line B—B of FIG. **8**. Internal pockets **434** are complementary to external gears **220** (FIG. **7**) of lower paddle group drive **200**, and external pockets **436** are complementary to internal gears **424** (FIG. **11**B) of lower impeller **412**.

As noted, FIG. **9** illustrates upper drive tube **480**. Upper drive tube **480** includes internal pockets **482**, pin hole **484**, and cap end **486**. FIG. **9**A is a section view of internal pockets **482** taken off of line A—A of FIG. **9**. Internal pockets **482** are complementary to external gears **198** (FIG. **6**) of upper paddle group drive **192**.

Upper paddle group **460** of FIG. **2** comprises upper impeller **462** and upper drive tube **480**. FIG. **10** is a side view of upper impeller **462**. FIG. **10**A is a sectional side view of upper impeller **462** taken generally off of line A—A of FIG. **10**. As seen in FIG. **10**A, upper impeller **462** includes lead paddle **464**, follow paddle **466**, and shaft **468**.

Lead paddle **464** includes frame **470** into which mesh **472** may be formed. Shaft **468** shown in FIG. **10**A preferably is a hollow tube having lumen **473**, lumen **472**, and pin hole **474**. Lumen **472** preferably has a smaller diameter than lumen **473**. Upper impeller **462** is formed by attaching lead paddle **464** and follow paddle **466** to shaft **468**, preferably angled as shown in FIG. **10** so that liquid is forced down as upper impeller **462** rotates.

Lower paddle group **410** of FIG. **2** comprises lower impeller **412** and lower drive tube **430**. FIG. **11** illustrates a side view of lower drive tube **430**. FIG. **11**A is a sectional side view of lower impeller **412** taken generally off of line A—A of FIG. **11**. FIG. **11**B is a top view of lower impeller **412** taken generally off of line B—B of FIG. **11**A.

As best seen in FIG. **11**A, lower impeller **412** includes lead paddle **414**, follow paddle **416**, and shaft **418**. Lead paddle **414** and follow paddle **416** preferably have a similar construction. Lead paddle **414** includes frame **420** into which mesh **422** may be formed. Similar to frame **470**, frame **420** of lead paddle **414** may lie within a single plane as shown in FIG. **11** or be curved, curled, angled and the like. Mesh **422** or mesh **472** may be any group of open spaces where each space is surrounded by material. The area of each open space **428** of mesh **422** (FIG. **11**A) is to be large enough to permit fluid to pass through open space **428**. The material has at least a first length and each open space **428** has at least a first length. The ratio of the first length of the material and the first length of an open space **428** may be one to one. This distance ratio of material measured in one direction to one open space **428** measured in one direction may also be two to one, one to two, or other decimal or whole number combinations so as to form a symmetrical or asymmetrical pattern.

In one embodiment, open spaces **428** are 1/32 inch by 1/32 inch squares, where the center of each open space **428** is located at a distance of 1/16 inch from adjacent centers of open spaces **428**. The internal perimeter contour of open space **428** may be square, round, oval, elongated, random, or any other contour that permits fluid to pass through open space **428**. The relative centers of each open space **428** may be of a uniform pattern such as shown in FIG. **11**A, of a random pattern, or a combination thereof. The internal perimeter contour of open space **428** may be straight, angled, curved, or any other shape that permits fluid to pass through open space **428**.

Shaft **418** of FIG. **11**A preferably is a hollow tube having internal gears **424** and registers **426** formed at a first end. internal gears **424** are best seen in FIG. **11**B. Lower impeller **412** may formed by attaching lead paddle **414** and follow paddle **416** to shaft **418** at a second end. Preferably, lead paddle **414** and follow paddle **416** are mounted to shaft **418** in a manner that contributes to forcing the liquid down as lower impeller **412** rotates. In one embodiment, lead paddle **414** and follow paddle **416** are mounted to shaft **418** at an angle of fifteen degrees as shown in FIG. **11**. Lead paddle **464** and follow paddle **466** of FIG. **10**A preferably have constructions that are similar to lead paddle **414** and follow paddle **416** shown in FIG. **11**A. Alternatively, these four paddles each may be of a distinct construction shape as well, or any combination thereof.

Referring back to FIG. **2**, container assembly **600** includes port cap **660** having flavor hatch **661** where port cap **660** is disposed within port **652** of lid **650**. Lid **650** fits within container **630**. As shown in FIG. **2**, wall thickness **702** preferably is continuous, but may vary, so as to define container interior **704**. Spout **706** is formed as part of wall thickness **702** at upper end **708**. On the opposing side of spout **706** is handle **710**. By manipulating handle **710**, liquid may flow out of container interior **704** over spout **706**. Container **630** also includes lower end **713**.

FIG. **2** also illustrates container bottom **604**, which serves as the bottom of container **630**. Container assembly **600** also includes heater housing **602** that may be formed from an injection molded plastic. Heater housing **602** serves to house heater **610** and provide a flat, stable bottom on which to rest container assembly **600**. Wall **830** of heater housing **602** forms cavity **830**, hole **834** (FIG. **12**), male connector housing **836**, and gap **840**.

Heater housing **602** is initially prepared by inserting upper terminals **622** of FIG. **2** into male connector housing **836**. Male prongs **842** of upper terminals **622** are complementary to sockets **238** (FIG. **14**A) of female connector **230**. Leads **844** of upper terminals **622** extend towards heater **610** and automatic switch **618** so that wires **850** (FIG. **15**) may be installed to provide power to heater **610** and automatic switch **618** as shown in FIG. **15**.

FIG. **12** illustrates a partial assembly of container assembly **600**. The features of container bottom **604** as shown in FIG. **12** include hole **720**, heater well **722**, groove **724** and

outer ring **726**. Stand pipe **727** is an elongated tube fixed within hole **720**, such as by welding, so as to form a water tight seal. Stand pipe **727** preferably is threaded at threaded end **729**.

As shown in FIG. **12**, o-ring **730** may be placed into groove **724**. As shown in FIG. **2**, groove **724** preferably is brought in contact with lower end **713** of container **630**. To secure container bottom **604** to lower end **713** of container **630**, outer ring **726** may be roll formed about lower end **713**. Where the roll form process is sufficiently tight, o-ring **730** may not be needed. The compression of o-ring **730** between lower end **713** and groove **724** forms a watertight seal.

Referring back to FIG. **12**, spacer nut **910** is placed about threaded end **729**. Mounting spring **614** is used to hold heater **610** firmly against container bottom **604** by securing mounting spring **614** against spacer nut **912** with nut **912**. Heater housing **602** is secured against nut **912** by placing o-ring **914** over hole **834**, inserting threaded end **729** through hole **834**, and tightening nut **916** about threaded end **729**.

Heater **610** is used to heat the liquid within container **630** as the liquid is turned into a froth. As shown in FIG. **12**, tube **802** is hollow and is formed into a circle in which free end **804** (FIG. **15**) meets free end **806**. Within tube **802** of FIG. **12** is wire **810** surrounded by insulator **812**. Wire **810** may be any high resistant material such as nickel cadmium. As electricity is passed through wire **812**, wire **812** radiates heat. Insulator **812** works to spread the concentrate heat from wire **810** to tube **802**. Preferably, insulator **812** is made of gypsum and tube **802** is made of aluminum, steel, or copper.

Lower housing assembly **100** of FIG. **2** also includes push button switch **20**. FIG. **13**A is a top view of push button switch **20** and FIG. **13**B is a side view of push button switch **20**, showing snap fits **21**. FIG. **14**A is a top view of female connector **230**, showing sockets **238** and FIG. **14**B is a side view of female connector **230**, showing mounting pegs **232** and terminals **234**.

As shown in FIG. **1**, pushbutton switch **20** is installed into switch aperture **150** (FIG. **4**A) of block **144** of systems housing **102** by inserting pushbutton switch **20** so that snap fits **21** extend past top surface **154** of block **144** and through switch aperture **150** so as to snap into place. Female connector **230** is similarly installed. As shown in FIG. **1**, mounting pegs **232** (FIG. **14**B) are inserted into peg bosses (FIG. **4**A) until female connector **230** is within mounting cutout **138** of recessed portion **140** (FIG. **4**A). Light bulb **24** (FIG. **1**) may then pressed into light hole **130** (FIG. **4**A) to appear external to systems housing **102** as shown in FIG. **1**.

FIG. **15** illustrates the mechanical support and the wiring of heater **610** and automatic switch **618**. Mounting spring **614** of FIG. **15** preferably comprises five arms **820** that extend above the plain of their common hub **822** (FIG. **12**) so that on installation, four of arms **820** are put into tension to apply compression against tube **802** of heater **610**. The fifth arm **820** is put into tension to apply compression against automatic switch **618** as shown in FIG. **15**. Where automatic switch **618** is a thermostat, the temperature detecting surface of the thermostat is held tight and flush against container bottom **604** as shown in FIG. **2**. Thus, the thermostat is able to sense the temperature of the liquid inside container **630** as the heat from the liquid conducts through container bottom **604**.

Automatic switch **618** may be used to trip and terminate the heating and frothing process upon reaching the desired temperature. Automatic switch **618** may be any device that automatically responds to temperature changes and activates switches controlling the equipment. Automatic switch **618** may also be a switch with an integral timer or a thermostat with a back up thermostat. Preferably, automatic switch **618** includes a temperature-sensitive bimetal disc that is used to actuate normally closed contacts so as to create an open in the electrical path of heater **610**. At a predetermined temperature, automatic switch **618** shuts off heater **610**. Phenolic automatic reset thermostat model 2450HR manufactured by Elmwood Sensors, Inc. of Providence R.I. may be used as automatic switch **618**.

Wiring **850** connects leads **844** of upper terminals **622** having male prongs **842** to automatic switch **618** and heater **610**. With wiring **850** in place, heater **610** is placed into heater well **722** (FIG. **12**), automatic switch **618** is placed on arm **820** and mounting spring **614** is brought to bear against heater **610** by tightening nut **912** as shown in FIG. **15**. Heater housing **602** of FIG. **12** may then be mounted to container bottom **604** using nut **916** sealed with o-ring **914** as shown in FIG. **12**.

With the components in place, power cord **30** (FIG. **1**) is wedged into power cord hole **134** (FIG. **4**B). Wires from power cord **30** are attached to relay **225** of FIG. **2**. Wires are distributed from relay **225** to the remainder electrical components. System bottom **104** may then be brought towards systems housing **102** so that shaft **210** (FIG. **7**) of lower paddle group drive **200** is threaded through upper bearing **222** (FIG. **2**). System bottom **104** is then pressed against systems housing **102** and held in place by thread forming screws placed through housing holes **108** (FIG. **3**A) and tightened into blind holes **136** (FIG. **4**A and FIG. **4**B). Cap nut **240** of FIG. **2** may be placed about lower paddle group drive **200**.

Included with impeller assembly **400** of FIG. **2** is knob **402**, lower paddle group **410**, and upper paddle group **460**. Knob **402** is fixed in cap end **486** (FIG. **9**) and permits a user of frother **10** to grasp and remove impeller assembly **400** from container assembly **600**, such as when cleaning frother **10**.

To assemble lower paddle group **410** of FIG. **2**, lower drive tube **430** is placed within lower impeller **412** until external pockets **436** mesh engage internal gears **424** and lower drive tube **430** seats against registers **426** of FIG. **11**A. To assemble upper paddle group **460** of FIG. **2**, upper drive tube **480** is placed into lumen **472** (FIG. **10**A) until pin hole **484** of upper drive tube **480** is aligned with pin hole **474** of upper impeller **462**. Stainless steal roll pin **490** of FIG. **2** is then placed through both pin hole **474** and pin hole **484** to lock upper impeller **462** to upper drive tube **480**. By inserting knob **402** into cap end **485** of upper drive tube **480** and inserting upper drive tube **480** into hollow portion **432** of lower drive tube **430**, impeller assembly **400** of FIG. **2** is formed.

To complete container assembly **600**, impeller assembly may be grasped at knob **402** disposed within upper drive tube as shown in FIG. **2**, and placed in container interior **704**. Lower drive tube **430** is inserted through stand pipe **727** of container bottom **604**. Including lid **650** and port cap **660**, container assembly **600** is now complete.

Frother **10** shown in FIG. **2** is assembled by bringing together heater housing **602** of container assembly **600** and container well **158** of lower housing assembly **100**. This allows internal pockets **434** of lower drive tube **430** and internal pockets **482** to be inserted over the associate external gears of lower paddle group drive **200** and upper paddle group drive **192**. The relationship between male prongs **842** of container assembly **600** and sockets **238** of female

connector **230** is also consummated as container assembly **600** is placed on top of lower housing assembly **100**.

In an alternative embodiment, upper paddle group **460** may be kept fixed or stationary by, for example, container projections **683** as lower paddle group **410** rotates. FIG. **16** is an isometric view of frother **10** showing upper paddle group **460** kept stationary as lower paddle group **410** rotates in the direction of arrow **21**. This may be thought of as lower paddle group **410** having a first rotated position and a second rotated position, wherein upper paddle group **460** is fixed in a position with respect to the first rotated position and the second rotated position. Fixed, angled, upper paddle group **460** also forces the liquid rising along the inside surface of container **630** back down into the rotating lower paddle group **410**. In this embodiment, upper paddle group **460** is not coupled to upper paddle group drive **192**.

To prevent liquid from traveling between a paddle and container **630**, a seal may be employed on each paddle in an alternate embodiment. As illustrated in FIG. **17** for lead paddle **464**, seal **500** may be comprised of coil spring **502** secured to lead paddle **464** and mesh screen **504**. Coil spring **502** may be a continuous loop coil spring secured to the circumference of lead paddle **464**. Mesh screen **504** is secured to lead paddle **464** by coil spring **502** so that, when impeller assembly **400** is placed within container **630**, coil spring **502** compresses slightly, thereby forcing mesh screen **504** against the inside wall of container **630**. Here, container **630** is preferably made out of glass to prevent container **630** from scratching as mesh screen **504** rubs against the inside of container **630**. Alternatively, a rubber wiper may extend from each paddle to the inside of container **630**.

The invention was tested using a stainless steel screen within a plastic frame for the paddles. Tests were run on serving sizes of both whole milk and skimmed milk. The results were as follows:

	TEST #1 - 1 Cup Whole Milk		
Average time	3 min-30 sec.	Range 2'20" to 3'50"	10 runs
Average froth	429 ML.	Range 320 to 500	10 runs
Average milk	160 ML.	Range 150 to 195	10 runs
	TEST #2 - ½ Cup Whole Milk		
Average time	2 min-25 sec.	Range 2'15" to 3'45"	3 runs
Average froth	130 ML.	Range 120 to 150	3 runs
Average milk	65 ML.	Range 50 to 80	3 runs
	TEST #3 - 1 Cup Skimmed Milk		
Average time	2 min-20 sec.	Range 2'17"	3 runs
Average froth	580 ML.	Range 500 to 650	3 runs
Average milk	150 ML.	Range 140 to 160	3 runs
	TEST #4 - ½ Cup Skimmed Milk		
Average time	2 min-10 sec.	Range 2'05" to 2/15"	3 runs
Average froth	350 ML.	Range320 to 380	3 runs
Average milk	65 ML.	Range 50.to 80	3 runs

In the preceding detailed description, the invention is described with reference to specific embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader scope of subject matter as set out in each claimed term. For example, frothing a liquid such as milk includes mixing, foaming, bubbling, lathering, creaming, stirring, effervescing, blending, fizzing, and spuming the milk. The liquid frothed may be adapted to be taken into the body by the mouth for digestion or absorption or be a substance not meant for consumption. The frother may be automatic or manually operated such as by a handle coupled to the gear train. Moreover, the frother may be run continuously to generate a continuous stream of froth. The written and drawing specification is, accordingly, to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. An apparatus to heat and froth milk, comprising:

a container having a bottom;

a lower paddle group disposed above the container bottom and having a first plurality of paddles;

an upper paddle group disposed above the lower paddle group and having a second plurality of paddles;

wherein each of said first and second plurality of paddles has a frame and a mesh disposed within the frame, said mesh having holes sized to enable frothed milk to be produced;

means for counter rotating the lower paddle group with respect to the upper paddle group;

wherein the means for counter rotating is disposed within a lower housing assembly removably coupled to the container and includes a motor coupled to a gear train, the gear train coupled to the lower paddle group and the upper paddle group and constructed so that the upper paddle group and lower paddle group rotate in opposite directions when power is supplied to the motor;

a heater disposed within the lower housing assembly.

2. The apparatus of claim **1**, the heater having an on and an off position, the apparatus further comprising:

means for detecting a temperature above the container bottom and for automatically placing the heater in the off position after detecting a predetermined temperature, wherein the means for detecting is disposed against and below the container bottom.

3. The apparatus of claim **2** further comprising:

a mounting spring having a plurality of arms wherein the heater is disposed between the mounting spring and the container bottom and wherein the means for detecting and for automatically placing is coupled to one arm.

4. The apparatus of claim **2**, wherein the means for detecting and for automatically placing is an automatic switch that is a thermostat.

5. The apparatus of claim **2**, further comprising:

a means for sealing disposed between each of said first and second plurality of paddles and an inside wall of the container wherein the means for sealing is a spring loaded mesh disposed on an end of each of said plurality of paddles.

6. The apparatus of claim **2**, wherein the means for counter rotating further comprises:

a power cord coupled to a relay, said motor coupled between the relay and the gear train, an on/off switch electrically coupled to the power cord, and a power indication light electrically coupled to the on/off switch.

7. The apparatus of claim **1**, wherein at least one paddle of said first and second plurality of paddles is disposed at an angle with respect to a direction of rotation of that paddle.

8. The apparatus of claim **7**, wherein the angle is fifteen degrees.

9. The apparatus of claim **1**, wherein the heater includes a high resistance wire disposed within an insulating material and wherein the insulating material is disposed within a hollow tube that defines a circular shape.

10. The apparatus of claim **9**, wherein the container bottom includes a heater well that rises above a plane of the container bottom and wherein the heater is disposed inside the heater well, adjacent to and below the container bottom.

11. The apparatus of claim **1**, wherein the means for counter rotating the lower paddle group with respect to the upper paddle group is adapted to rotate the lower and upper paddle groups at 400 to 600 revolutions per minute.

12. The apparatus of claim 1, wherein said mesh is formed using stainless steel.

13. A frother for frothing liquids, comprising:

a container having a longitudinal axis;

means for rotating located adjacent to the container;

a lower lead paddle coupled to the means for rotating, the lower lead paddle having material removed to define a plurality of holes;

an upper lead paddle coupled to the means for rotating, wherein rotation of the lower lead paddle and upper lead paddle is within the housing about the longitudinal axis;

a lower follow paddle coupled to the lower lead paddle to define a lower paddle group;

an upper follow paddle coupled to the upper lead paddle to define an upper paddle group;

the lower follow paddle having material removed to define a plurality of holes, the lower paddle group having a first rotated position and a second rotated position, wherein the upper paddle group is fixed in a position with respect to the first rotated position and the second rotated position;

wherein each of the plurality of holes defines a mesh;

wherein each mesh is a group of open spaces wherein each open space is surrounded by material, the material having at least a first length and each open space having at least a first length wherein the ratio of the first length of the material and the first length of an open space is one to one;

each open space having a center, wherein each open space measures 1/32 inch in a first direction and 1/32 inch in a second direction, and wherein the center of each open space is located at a distance of 1/16 inch from the centers of adjacent open spaces, and further wherein

the means for rotating is disposed within a lower housing assembly coupled to the container having a longitudinal axis, the means for rotating having a power cord coupled to a relay, a motor coupled between the relay and a gear train, the gear train coupled to the lower paddle group and the upper paddle group, the means for rotating further having an on/off switch electrically coupled to the power cord, and a power indication light electrically coupled to the on/off switch.

14. The frother of claim 13, each open space having a perimeter, wherein each perimeter of each open space is circular, wherein each paddle resides at an angle of fifteen degrees with respect to the longitudinal axis, and the upper paddle group and the lower paddle group are adapted to rotate about the longitudinal axis along a circular path, and further wherein

the gear train includes a drive pinion coupled between a drive gear of a dual gear and the motor, an upper paddle group drive coupled to a bevel gear of the dual gear at a first location, a lower paddle group drive coupled to the bevel gear at a second location, wherein the second location opposes the first location.

15. The frother of claim 13, wherein the upper lead paddle has material removed to define a plurality of holes, the upper follow paddle has material removed to define a plurality of holes, wherein the lower paddle group is adapted to rotate in a direction that is opposite of the direction of rotation of the upper paddle group.

16. The frother of claim 15, each open space having a perimeter, wherein each perimeter of each open space is circular, wherein each paddle resides at an angle of fifteen degrees with respect to the longitudinal axis, and the upper paddle group and the lower paddle group are adapted to rotate about the longitudinal axis along a circular path, and further wherein

the gear train includes a drive pinion coupled between a drive gear of a dual gear and the motor, an upper paddle group drive coupled to a bevel gear of the dual gear at a first location, a lower paddle group drive coupled to the bevel gear at a second location, wherein the second location opposes the first location.

17. The frother of claim 15, wherein the container has an inside wall, and a first, second, third, and fourth means for sealing, each paddle having one means for sealing disposed between that paddle and the inside wall of the container.

18. The frother of claim 17, wherein the container has an exterior bottom and the means for sealing is a spring loaded mesh disposed on an end of a paddle, the frother further comprising:

a heater coupled to the exterior bottom of the container.

19. The frother of claim 15, wherein the motor has a rotational direction and a means for changing the rotational direction of the motor after a predetermined period of time.

20. The frother of claim 19 wherein the means for changing is a manual switch.

21. The frother of claim 19 wherein the means for changing is a computer chip programmed to change the motor directions as a function of at least one of time and pressure against the lower lead paddle.

22. The frother of claim 21 wherein the rotational direction of the motor is reversed at a point within each sequential time interval of ten and forty seconds.

23. The frother of claim 22 wherein the rotational direction of the motor is reversed after each twenty seconds.

24. An automatic beverage frother, comprising:

a lower housing assembly having a power cord coupled to a relay, the lower housing assembly further having a motor coupled to a gear train, an on/off switch electrically coupled to the power cord, and a power indication light electrically coupled to the on/off switch; and

a container assembly coupled to the lower housing assembly, the container assembly including a handle attached to an exterior location on the container, a lid removably coupled to an exterior location on the container, a port cap removeably disposed within the lid, a flavor hatch coupled to the port cap, an upper paddle group coupled to the gear train, a lower paddle group coupled to the gear train, a heater coupled to the power cord, and a thermostat coupled to the power cord.

25. The automatic beverage frother of claim 24, the container assembly removeably coupled to the lower housing assembly, wherein the gear train includes a drive pinion coupled between a drive gear of a dual gear and the motor, an upper paddle group drive coupled to a bevel gear of the dual gear at a first location, a lower paddle group drive coupled to the bevel gear at a second location, wherein the second location opposes the first location,

wherein the upper paddle group is removeably coupled to the upper paddle group drive, the lower paddle group is removeably coupled to the lower paddle group drive, the heater is removeably coupled to the power cord, and the thermostat is removeably coupled to the power cord.

* * * * *

EXHIBIT G

United States Patent [19]

Brown et al.

[11] **Patent Number: 4,537,332**

[45] **Date of Patent: Aug. 27, 1985**

[54] **BEVERAGE DISPENSER WITH IMPROVED IN-BOWL WHIPPER**

[75] Inventors: **Merle S. Brown**, Cohasset; **William A. Arzberger**, Medfield, both of Mass.

[73] Assignee: **Jet Spray Corp.**, Norwood, Mass.

[21] Appl. No.: **430,234**

[22] Filed: **Sep. 30, 1982**

[51] **Int. Cl.**[3] **B67D 1/10**

[52] **U.S. Cl.** **222/190**; 222/333; 222/376; 222/377; 62/392; 261/93

[58] **Field of Search** 222/190, 377, 333, 372, 222/376; 261/93; 62/392; 366/306

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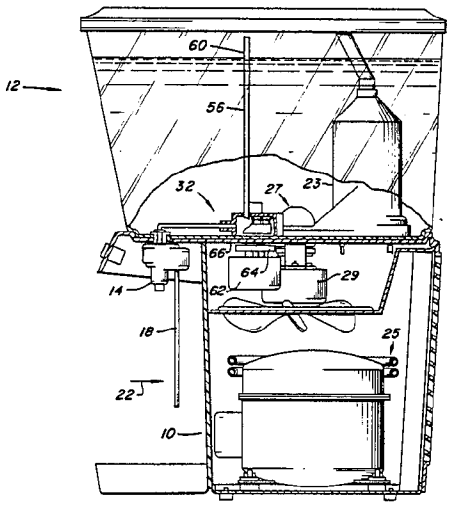
Primary Examiner—Joseph J. Rolla
Assistant Examiner—Frederick R. Handren
Attorney, Agent, or Firm—Wolf, Greenfield & Sacks

[57] **ABSTRACT**

A non-carbonated beverage dispenser having an in-bowl whipper assembly which includes a housing disposed in the bowl and immersed in the beverage, a magnetically driven impeller in the housing, and a discharge passage from the housing connected to the spigot of the dispenser to discharge the whipped beverage from the bowl. The whipper is rotated at 4000 rpm or above, and the height of the impeller blades is made very small (in the order of 1/32 to 1/16 inch) to produce very fine and uniform bubbles in the beverage without uncoupling the magnetic drive.

5 Claims, 5 Drawing Figures



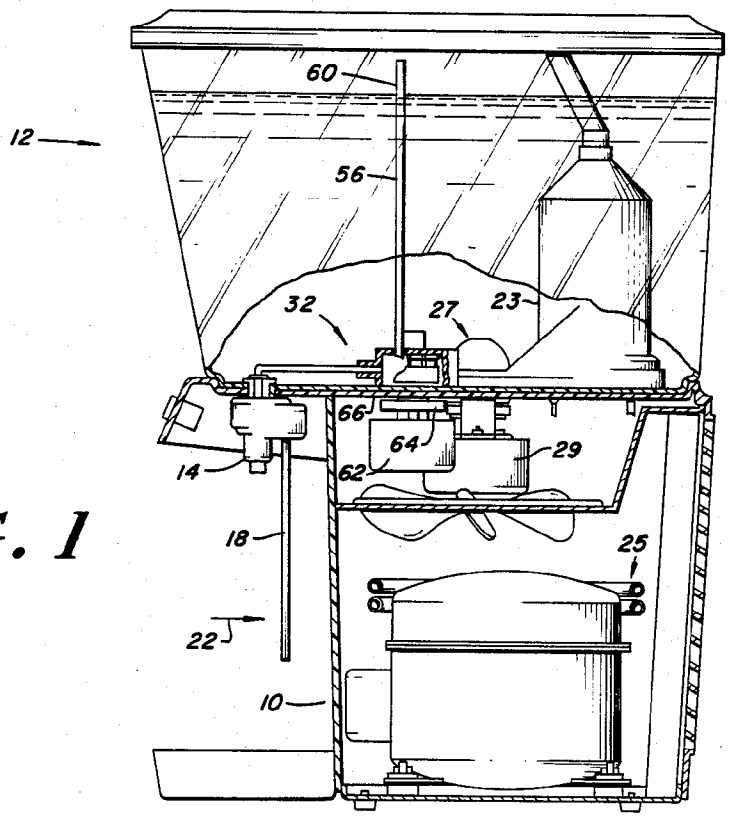

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FIG. 1

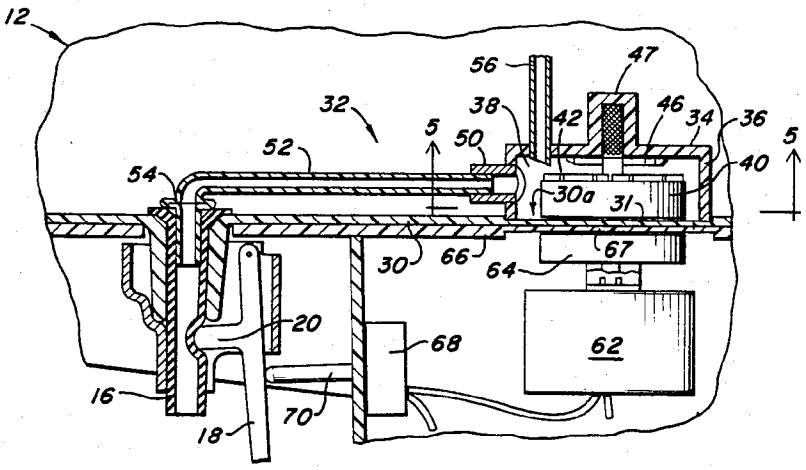
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FIG. 2

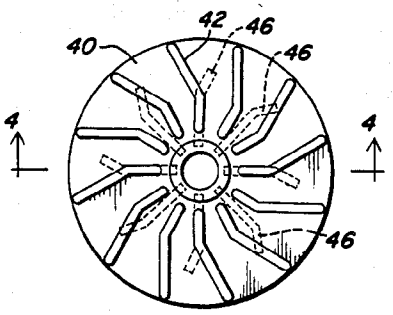

FIG. 3

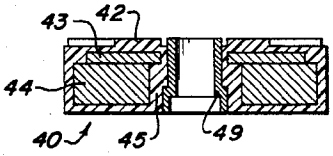

FIG. 4

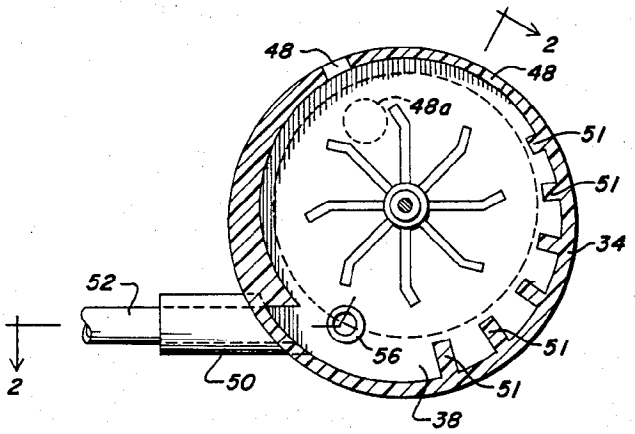

FIG. 5

BEVERAGE DISPENSER WITH IMPROVED IN-BOWL WHIPPER

INTRODUCTION

This invention relates to non-carbonated beverage dispensers having in-bowl whippers for frothing the beverage immediately before it is discharged. The invention has particular application in refrigerated beverage dispensers. The invention is an improvement over the in-bowl whipper shown in prior U.S. Pat. No. 3,920,163 dated Nov. 18, 1975 and assigned to the assignee of this application.

Prior U.S. Pat. No. 3,920,163 describes in detail the advantages of an in-bowl whipper over the conventional whippers widely used, which are disposed outside the bowl in association with the discharge spigot of the dispensers. These advantages are very important, and the invention of the prior U.S. Pat. No. 3,920,163 has met with very considerable commercial success.

The disadvantages of the exterior whippers bear repeating. First, because the whippers are mounted exterior of the bowl and consequently are not refrigerated, any beverage which is left in the whipper may become warm and if left there long enough, may spoil because of a build up of bacteria. Second, with external whipper assemblies the on-off valve is disposed between it and the bowl, and consequently the operator must shut the valve before the cup is filled and approximate the volume of beverage in the whipper housing, and frequently the cup either overflows or is not filled. Third, the external whipper assemblies which normally are attached to the bottom of the discharge spigot necessitate lowering the drip tray to accommodate this extra attachment on the front of the machine. Fourth, even though the whipper assemblies in the prior art are mounted externally of the bowl, they are not ordinarily readily disassembled, and consequently they are difficult to clean. Fifth, the whipper assemblies of the prior art ordinarily have a shaft which projects from the dispenser base into the whipper housing, and the shaft seals are prone to wear and cause leakage.

All of the disadvantages of the exterior whippers described above are eliminated by the in-bowl whippers. Because the whipper assembly is disposed within the refrigerated bowl, the beverage which remains in the whipper assembly does not become warm and/or spoil. This is particularly important for dairy based drinks. The on-off valve is located downstream of the whipper, and therefore the operator need not approximate the contents of the whipper assembly in determining when the valve should be closed. Furthermore, the whipper of the present invention may merely be dropped into the bowl, and it can be removed conveniently for cleaning. Furthermore, there are no shafts which extend into the whipper housing that necessitate seals which may wear and leak.

In the earlier U.S. patent, supra, and in accordance with the present invention, the whipper assembly includes a housing which is disposed inside the beverage bowl, and the housing in turn includes an inlet which is in constant communication with the bowl and a discharge passage which is connected to the spigot of the dispenser. An impeller in the housing is magnetically driven by a motor and drive magnet located outside the bowl within the dispenser base. The blades on the impeller cooperate with fins in the housing to cause a whipping action of the beverage. An air inlet tube is

connected to the housing and its upper end is located above the beverage in the bowl. Air is entrained into the housing through the tube to further froth the beverage.

Applicants have discovered that the quality of whipping can be appreciably improved by rotating the impeller at greater speeds than was the practice heretofore and by reducing the height of the impeller blades. In the commercial embodiment of the whipper of the earlier patent, a shaded pole fractional horsepower motor was employed which rotated at approximately 3,200 rpm, and the blades of the impeller were approximately 3/16 inch in height. Applicants have now discovered that a much finer and more uniform bubble size can be achieved by rotating that whipper at 4,000 rpm or more, and substantially reducing the height of the whipper blades to 1/16 inch or less. Moreover, the consistency of the beverage may also be improved by reducing the inlet to the whipper housing to one or more ports whose location is selected with the particular beverage to be dispensed in mind. This combination produces markedly improved whipping without interfering with the coupling between the drive and driven magnets.

It is very important that the magnetic coupling between the drive magnet and the driven magnet within the impeller be preserved. The higher rotational speed of the motor which drives the drive magnet increases the load on that coupling. When the coupling is broken, the impeller may shift in the bowl and necessitate the operator manually hunting for the impeller in the beverage with his hands to reposition it. In accordance with the present invention a sump is provided in the bottom of the bowl in which the whipper housing is seated, and the bottom wall thickness of the sump is reduced to approximately 0.060 inch to reduce the gap between the magnets to approximately 0.250 inch so as to improve the coupling and hold the whipper in place.

The features and advantages of this invention will be better understood and appreciated from the following detailed description read in connection with the accompanying drawings.

BRIEF FIGURE DESCRIPTION

FIG. **1** is a side view, partly in section, showing a beverage dispenser constructed in accordance with the invention;

FIG. **2** is an enlarged, fragmentary, cross-sectional view of the whipper assembly and discharge spout of the dispenser in FIG. **1**;

FIG. **3** is a top view of the impeller with the housing vanes suggested in broken lines.

FIG. **4** is an enlarged cross-section of the impeller taken on section line **4**—**4** in FIG. **3**; and

FIG. **5** is a cross-sectional view through the whipper assembly housing and suggesting alternative locations for the inlet to the housing.

DETAILED DESCRIPTION

The beverage dispenser shown in the drawing includes a base **10** and bowl **12** which typically may be like the beverage dispenser shown in U.S. Pat. No. 3,822,565 entitled "Beverage Dispenser" and assigned to the assignee of this application. The bowl has a discharge spigot **14** through which the beverage in the bowl is dispensed to a cup or other container. The spigot is controlled by a pinch tube **16** made of flexible material such as rubber and push handle **18** pivotally supported beneath the bowl and having a finger **20**

which pinches the tube to close it when the handle is released. When the handle is pushed rearwardly as suggested by arrow **22** in FIG. **1** of the drawing, the finger releases the tube and the beverage in the bowl may flow into the cup.

The beverage dispenser includes a refrigeration system having an evaporator **23** in the bowl in heat exchange relationship with the beverage to cool it. The other parts of the refrigeration system including a condenser, compressor and fan collectively identified by number **25**, are mounted in base **10**. In addition, a circulating system including a pump **27** may be disposed in the bowl and be driven by a motor **29** magnetically coupled to it, to circulate the beverage so as to maximize the heat exchange between the beverage and evaporator.

The whipper assembly **32** rests on the bottom wall **30** of the bowl **12**. The assembly has a generally cylindrical housing **34** open at bottom **36** which defines a whipping chamber **38** that houses an impeller **40**. As shown in FIG. **4**, the impeller includes blades **42**, backup plate **43**, driven magnet **44**, frame **45** and bushing **49**. A plurality of fins **46** are carried on the inside of the housing within chamber **38**. The fins **46** extend downwardly toward the blades **42** and cooperate with them when the impeller rotates to whip up the beverage which enters the housing. It will be noted in FIG. **3** that the outer ends of blades **42** and fins **46** are turned toward one another with respect to the direction of rotation of the impeller and that blades **42** extend radially beyond the fins to enhance the whipping action.

It will be noted in FIG. **2** that bottom wall **30** of the bowl is formed with a sump **30***a* whose bottom wall **31** is substantially thinner than the surrounding area. In the preferred embodiment, the regular wall thickness is 0.175 inch, while the thickness of wall **31** is 0.060 inch. The side wall **36** of the housing **34** rests on the wall **31** within the sump to position the housing **34** and prevent it from shifting in the bowl. Ihe drip tray **66** which supports the bowl is also substantially thinned out at **67** as shown in the drawing. The total thickness of the walls **31** and **67** is approximately 0.120 inch so as to reduce the gap between the magnets as is discussed more fully below.

The housing **34** has a pair of inlet ports **48** in its side wall (see FIG. **5**) which are open to the beverage in bowl **12** so that the beverage may flow freely into the chamber **38**. It has been determined that when lighter beverages are being whipped, the two ports in the side wall produce a better consistency in the beverage and promote a faster flow rate. On the other hand, if a heavier beverage such as a milk shake is being dispensed, a single large inlet port in the top wall of the housing as suggested by broken lines at **48***a* is preferred. Housing **34** also includes a discharge passage **50** in side wall **36** and distal from inlet ports **48** or **48**A. The impeller **40** is eccentrically suspended in chamber **38** by shaft **47** that passes through bushing **49**, and the impeller and housing form a volute that increases in size from inlet port **48** (or **48***a*) to outlet passage **50**. A number of vertical ribs **51** attached to the housing **34** occupy the volute at its wider end, and the width of ribs **51** increase successively toward outlet passage **50**. These ribs further increase the churning and whipping action in the chamber **38** as the impeller rotates.

In the embodiment shown a feeder tube **52** directly connects the discharge passage **50** with the upper end of pinch tube **16** so that the full discharge from the whipper assembly flows directly to spigot **14**. In order to position the feeder tube **52** with respect to the pinch tube, feeder tube **52** is upset as suggested at **54**. This serves not only to properly position the feeder tube with respect to the spigot but also serves to level the whipper housing in bowl **12**.

An air inlet tube **56** is mounted on housing **34** and communicates with chamber **38** adjacent discharge passage **50**. The upper end **60** of the air inlet tube is located above the liquid level in the bowl. The lower end of the tube within chamber **38** is inclined so as to face discharge passage **50** (see FIG. **2**). This creates a low pressure region in chamber **38** to draw air into the chamber as the impeller rotates.

The whipper assembly **32** is driven by motor **62** located in base **10**, which carries a drive magnet **64** magnetically coupled to whipper magnet **44** through bottom wall **31** of bowl **12** and wall **67** of the condensate tray **66** which supports the bowl. The motor is energized by a circuit which includes switch **68** having plunger **70** in the path of push handle **18** when the handle is moved rearwardly to open the pinch tube. Consequently, when the valve established by pinch tube **16** and handle **18** is open, motor **62** is energized, which in turn energizes the whipper assembly. And when the valve is closed by release of handle **18**, the motor is deenergized to shut off the whipper assembly. The gap between the two magnets **44** and **64** is approximately 0.250 inch, which essentially assures that the magnets will remain coupled at all times during normal running speeds even with the heaviest beverages. And should uncoupling occur, the whipper will remain in place so that the machine may be restarted without having to fish for the whipper in the beverage.

When the whipper assembly is placed in operation by actuation of switch **68**, the impeller rotates, and blades **42** in cooperation with fins **46** and **51** stir the beverage in chamber **38**. Simultaneously, as the beverage flows into discharge passage **50**, the low pressure region established below air inlet tube **56** causes air to be entrained through the tube to add a frothiness to the whipped drink. When the cup is filled, the operator merely releases the handle which in turn stops the motor and deactivates the whipper assembly. The motor of the circulating system is uneffected by this action.

It will be noted that there are no fittings or clamps which seal the whipper housing **34** against lower wall **30** of the bowl. Consequently, when the beverage in the bowl is stirred by the circulating pump **27**, beverage will flow around and through the chamber **38** because of the lack of seals. The open bottom **36** provides substantial access to the interior of the bowl from the chamber **38**, and therefore there is no stagnation of beverage in the whipper housing.

The magnetic drive for the whipper performs yet another function. It assists in holding the housing **34** in the bowl without the use of special clamps or other such devices. The driven magnet **44** which is suspended from the housing is pulled into registration with drive magnet **64**. The mechanism is therefore self aligning, and the magnets by their mutual attraction assist in retaining the assembly in place. The upset **54** on the feeder tube **52** assures that the housing is level in the bowl.

In accordance with the present invention, the motor **62** which rotates the drive magnet **64** rotates at a rate of between 4000 and 8000 rpm, which is substantially greater than the speed at which the in-bowl whipper

was previously rotated. This is accomplished by using a series-type brush motor rated of approximately 1/10 horsepower. By increasing the speed to the range of 4000 rpm or more, a smoother whipping of the beverage is produced of fine and more uniform bubbles which in turn are better retained in the drink. Also in accordance with this invention, the height of the blades **42** of the whipper **40** is reduced to the range of 1/32 to 1/16 inch. This greatly reduced blade height contributes to the finer and more uniform bubbles in the whipper beverage and with the reduced thickness of walls **31** and **67** prevent the two magnets from uncoupling during operation of the whipper.

Having described this invention in detail, those skilled in the art will appreciate that numerous modifications may be made of the embodiments illustrated and described without departing from the spirit of this invention. Therefore, it is intended that the scope of this invention be determined by the appended claims and their equivalents.

We claim:

1. In a beverage dispensing machine having a base and a bowl mounted above the base, a whipper assembly for frothing non-carbonated beverages dispensed by the machine comprising

a housing adapted to be immersed in the beverage in the bowl,

said housing having a top wall and a generally cylindrical side wall,

an outlet passage from the housing in the side wall, and a pair of inlet ports in the side wall distal from said outlet passage,

an impeller body in the housing having a driven magnet imbedded therein,

impeller blades formed on the top surface of the body, said blades not exceeding 1/16 inch in height,

fins mounted on the housing and extending downwardly toward the blades,

a drive magnet mounted in the base and magnetically coupled to the driven magnet in the impeller, and

a motor in the base connected to the drive magnet for rotating the impeller at 4000 to 8000 rpm.

2. In the whipper assembly as defined in claim **1**, said motor being a series brush-type motor.

3. A beverage dispenser as described in claim **1** further characterized by

a sump in the bottom wall of the bowl and the housing being mounted in the sump,

said magnets being coupled through the bottom wall of the sump, the gap between the magnets being approximately 0.250 inch.

4. A beverage dispenser comprising

a base and a bowl mounted on the base for containing the beverage to be discharged by the dispenser,

a spigot connected to the bowl through which the bowl contents may be discharged,

a valve operatively associated with the spigot for opening and closing it to control the flow of beverage from the bowl,

a whipper assembly within the bowl and intended to be immersed in the beverage in the bowl,

said assembly including a housing having a top wall and a generally cylindrical side wall,

a pair of inlet ports in the side wall for enabling beverage in the bowl to enter the housing,

an impeller in the housing,

said impeller having blades on its upper surface not exceeding 1/16 inch in height,

fins formed in the housing and cooperating with the blades on the impeller for whipping beverage in the housing when the impeller rotates, and

an outlet passage in the housing side wall distal from said inlet ports and connected to the spigot for discharging beverage whipped, in the housing,

means including a motor in the base operatively connected to the impeller for rotating the impeller to activate the whipper assembly,

means operatively connecting the valve and the motor causing the motor to activate the whipper when the valve is open and deenergize the whipper when the valve is closed, and

an air inlet tube connected to the housing and adapted to extend above the beverage in the bowl and communicating with the interior of the housing adjacent the outlet passage for introducing air into the housing to be used in whipping the beverage in the whipper assembly, and

said dispenser being characterized by said motor rotating the impeller at above 4000 rpm.

5. A beverage dispenser as described in claim 4 further characterized by

said spigot including a pinch tube and a push handle connected to the valve cooperating therewith to open and close the spigot, and

a feeder tube joining the housing outlet and pinch tube to carry whipped beverage from the housing to the spigot.

* * * * *

EXHIBIT H

US005374444A

United States Patent [19]

Langner

[11] Patent Number: 5,374,444

[45] Date of Patent: * Dec. 20, 1994

[54] **FIBER BEVERAGE AND METHOD OF MANUFACTURE**

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[*] Notice: The portion of the term of this patent subsequent to Jan. 12, 2010 has been disclaimed.

[21] Appl. No.: **127,944**

[22] Filed: **Sep. 28, 1993**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 903,986, Jun. 24, 1992, Pat. No. 5,254,357, which is a continuation-in-part of Ser. No. 850,005, Mar. 10, 1992, Pat. No. 5,178,896, which is a continuation-in-part of Ser. No. 735,083, Jul. 24, 1991, abandoned, which is a continuation-in-part of Ser. No. 722,878, Jun. 28, 1991, abandoned.

[51] **Int. Cl.**[5] **A23L 2/00**

[52] **U.S. Cl.** **426/590**; 426/804

[58] **Field of Search** 426/590, 573, 804, 578, 426/658

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[57] **ABSTRACT**

A dietary fiber supplement in beverage and liquid concentrate liquid dosage forms wherein the dietary fiber source is cellulose ether. A method of making the dietary fiber supplement is also disclosed.

23 Claims, No Drawings

FIBER BEVERAGE AND METHOD OF MANUFACTURE

This is continuation-in-part of U.S. patent application Ser. No. 903,986, filed Jun. 24, 1992, now U.S. Pat. No. 5,254,357, which is a continuation-in-part of U.S. patent application Ser. No. 850,005, filed Mar. 10, 1992 now U.S. Pat. No. 5,178,896, which is a continuation-in-part of U.S. patent application Ser. No. 735,083, filed Jul. 24, 1991, abandoned, which is a continuation-in-part of application Ser. No. 722,878, filed Jun. 28, 1991, abandoned.

FIELD OF THE INVENTION

This application generally relates to dietary fiber, in particular to a fiber beverage and a method of making a fiber beverage.

BACKGROUND OF THE INVENTION

Dietary fiber is a term for a variety of plant substances that are resistant to digestion by human gastrointestinal enzymes. Dietary fiber supplements contain naturally occurring plant fiber such as psyllium, semisynthetic fiber such as methylcellulose and the like cellulose ether derivatives of cellulose or synthetic fiber such as calcium polycarbophil.

Dietary fibers can be divided into two groups, based on their water solubility. The structural or matrix fibers, cellulose for example, are insoluble. The natural fibers, pectins for example, are soluble.

The addition of fiber to the human diet has attracted increasing interest in recent years as the shortcomings of the diets of western countries have become known. The current prevalence of diseases including diabetes, coronary heart disease, colorectal cancer and gastrointestinal disorders such as constipation, hemorrhoids and diverticular disease, are associated with, among other things, diets containing more fat and less fiber.

It has been suggested that increasing dietary fiber intake may help prevent many diet-related disorders and/or mitigate their course. The American Diabetes Association and National Cancer Institute recommend diets high in fiber and complex carbohydrates and low in fat. Physicians and pharmaceutical companies have attempted to correct the deficiency of dietary fiber with products that struggle to achieve this purpose.

Because Westernized diets are made up of so many highly processed, low-fiber foods, it takes a concerted effort to begin a high-fiber dietary habit. However, it must be remembered that it is extremely difficult for most people to make major changes in eating habits. Therefore, the use of dietary fiber supplements is becoming more widespread.

Currently available fiber supplements include Metamucil®, which contains psyllium as the active ingredient; Citrucel®—a methylcellulose composition supplied in powder form; Fibercone®, which contains calcium polycarbophil as the fiber source.

U.S. Pat. No. 4,988,530 to Hoersten et al. is drawn to a beverage containing pectin having a degree of esterification of at least 50%. Hoersten et al. discloses the two groups of dietary fiber, insoluble fiber and soluble fiber, and identifies the problems associated with using each group as a fiber source in food products. When incorporated into liquid food formulations, the insoluble dietary fibers are difficult to maintain in proper suspension or dispersion and tend to settle to the bottom of drinks and

beverages. Additionally, the insoluble dietary fibers provide the liquid foodstuffs with a gritty texture and are not particularly pleasant tasting.

Because of their solubility, the soluble dietary fibers do not have a gritty texture associated with their use. The soluble fibers, however, tend to thicken liquid products and can affect the original sensory mouthfeel of the unmodified liquid. The Hoersten et al. patent also recognizes the obstacles in the use of carboxylmethylcellulose as a liquid dietary supplement. The addition of carboxymethylcellulose to water or juice was thought to require prompt consumption or the solution would result in thickening to the consistency of partially set gelatin or wallpaper paste.

Additional related art includes U.S. Pat. No. 3,455,714 which discloses cellulose derivatives with a water soluble cellulose ether coating to improve the dissolution of insoluble cellulose fibers in water, however, a beverage or liquid form of the water-soluble composition is not disclosed; and U.S. Pat. No. 4,321,263 discloses coating psyllium with a polyethylene glycolpolyvinyl pyrrolidone composition also to improve dispersability of psyllium in water.

Accordingly, there exists a need for a dietary fiber supplement available in a liquid dosage form, containing methyl cellulose or the like soluble cellulose ether derivatives of cellulose, thus making the addition of fiber to one's diet pleasant tasting and effective.

BRIEF DESCRIPTION

This invention comprises a dietary fiber supplement and method of making the supplement. The invention comprises water soluble cellulose ethers including, for example, methylcellulose, supplied in liquid dosage form in an amount in the range of from about 0.3 weight percent to about 4.5 weight percent and preferably from about 0.5 weight percent to about 1.7 weight percent. The supplement is available in liquid dosage form as a beverage for consumption as a dietary fiber supplement, as well as a liquid concentrate which can be readily diluted by a consumer to provide the desired dietary fiber supplement in beverage dosage form.

The method of making the supplement is another aspect of the invention. The method of making the beverage and the liquid concentrate include dispersing a fiber source in water and maintaining the fiber in solution such that the supplement is supplied in liquid form to consumers. The method of making the beverage in individual beverage dosage form includes a heating and cooling treatment while the method of making the concentrate is carried out at room temperature.

DETAILED DESCRIPTION OF THE INVENTION

It is an object of the current invention to provide a dietary fiber supplement to be supplied in liquid dosage form to consumers. The liquid dosage form of the supplement may be a beverage, or alternatively a liquid syrup concentrate. When the liquid dosage form is a beverage, the amount of a cellulose ether dietary fiber supplement such as methylcellulose therein is about 0.5 weight percent per serving (10 ounces); the concentrate composition includes about 1.7 weight percent of the cellulose ether dietary fiber supplement such as methylcellulose. Each beverage serving of the fiber supplement prepared from the concentrate composition provides about 0.5 weight percent per serving of a cellulose ether fiber supplement such as methylcellulose.

This invention provides the direct liquid form dietary fiber supplement product in two forms: as a liquid concentrate to be diluted prior to consumption; and as an individual serving size, packaged liquid product for immediate drinking. The two products are prepared by somewhat different processes.

One aspect of this invention provides a process for preparing a dietary fiber supplement liquid, water-dilutable concentrate composition containing about 1.0 to about 4.5 percent and preferably to about 2.3 percent w/w of a water soluble cellulose ether fiber as described hereinafter in greater detail which involves mixing the water soluble cellulose ether in powder form with a pharmaceutical or food grade of a high density liquid diluent such as high fructose corn syrup, olive oil, vegetable oil or glycerine, preferably high fructose corn syrup, in proportions of from about 1 to about 4 parts by volume of the liquid diluent to 1 part by weight of the cellulose ether and in an amount sufficient to provide the concentrate composition being prepared with a concentration of from about 1.0 to about 4.5 percent and preferably to about 2.3 percent w/w of the cellulose ether in the finished liquid concentrate. The high density liquid diluent and cellulose ether components are mixed at a stirring rate of from about 200 to 1000 RPM, preferably from about 250 to 500 RPM, and more preferably from 300–400 RPM for a time sufficient to obtain a substantially uniform mixture of the cellulose ether with the liquid diluent. Usually, about 10 minutes is sufficient. Other additives such as flavoring materials, acidulants, heat, light and/or color stabilizer materials, either as such, or diluted with water, can be added to this cellulose ether/liquid diluent mixture with stirring at essentially the same mixing rate. Usually a preservative, such as sodium benzoate can be added to the concentrate composition at this time in an amount to effectively sterilize the concentrate. Then, while continuing to stir the mixture at from about 200 to 1000 RPM, preferably at from about 250–500 RPM, the resulting mixture is mixed and diluted with cold (about 40° to 50° F.) water in an amount and for a time sufficient to provide the resulting concentrate composition with a concentration of cellulose ether such that, usually after packaging and shipping, when the concentrate formulation is diluted with about 3 parts of water by volume per each volume part of the concentrate composition, the thus diluted concentrate will provide a beverage form composition which will contain about from about 1 to 4 grams, preferably 1.5 grams of the cellulose ether fiber in a concentration from about 0.3 to 1.3 weight percent preferably from about 0.45 to about 0.55 weight percent, e.g., about 0.485 percent weight/weight, per 10 ounce serving of the resulting beverage strength composition.

Individual serving size packaged containers of the dietary fiber supplement, aqueous beverage compositions of the invention can be prepared somewhat differently than how the concentrate composition is prepared. This invention provides a process for preparing individual serving size packages of the dietary fiber supplement liquid/beverage composition which contains from about 0.3 to about 1.3 and preferably from about 0.45 to about 0.55 weight/volume percent of a water soluble cellulose ether fiber herein described and in a sufficient individual serving volume size of the aqueous beverage composition to provide from about 1 to about 4 grams and preferably from about 1 to 2 grams of said cellulose ether fiber per 10 ounce liquid serving.

In accordance with the practice of the invention, the water soluble cellulose ether is added to and mixed into a stirred high density liquid diluent as exemplified above, but preferably high fructose corn syrup, in proportions of from about 1 to about 4 parts by volume of the high density liquid diluent per part by weight of the cellulose ether while agitating as by stirring in a vessel at a rate of from about 200 to about 1000 RPM, preferably at a rate of about 250 to about 500 RPM and more preferably at 300 to 400 RPM while maintaining the mixture at a cold temperature to room temperature for a time sufficient to form an essentially uniform mixture. Usually stirring for about 10 minutes is sufficient. While continuing to maintain essentially the same stirring or agitation rate, other desired additives such as flavoring, acidulant, preservatives, antioxidants and flavor or color stabilizers can be added, either as such or by being first diluted with water, until a uniform consistency of the mixture is obtained. Usually, stirring the mixture at this rate for up to 10 minutes for each additive is sufficient. Then, cold water (about 40°–50° F.) is added with stirring as above noted in a volume sufficient to dilute the mixture to provide the final composition with the desired beverage concentration of from about 3.0 to 13, preferably 4.5 to 5.5, weight/volume percent of cellulose ether fiber in the beverage liquid batch.

After any desired sample testing of the batch beverage composition, the bulk beverage composition is then packaged into individual serving size containers, and pasteurized, e.g., either by known bulk flash heating in coiled pipes, or the like, treatment processes, but more commonly by passing the beverage containers through a heating line to heat the beverage contents to about 156°–158° F. for a time, usually about 10 to 15 minutes, sufficient to sterilize the beverage liquid contents in the containers. Thereafter, particularly if the beverage had been flash heated in bulk to pasteurize the product, the beverage liquid containers are cooled either in a refrigerator or a freezer. In a refrigerator, the beverage packs should be cooled to at least 50° F. for about eight hours or in a freezer compartment for two or four hours. These process operations stabilize the shelf storage of the beverage in single serving containers for up to about two years of acceptable product life.

While, as indicated, the beverage composition of the invention can be provided in a single serving container, the liquid concentrate is advantageous in that it furnishes multiple servings per container and decreases the amount of shelf space needed for storage. The liquid concentrate composition of the invention is diluted with water such that the amount of cellulose ether fiber is from about 0.3 to about 1.3 and preferably about 0.5 weight percent per serving (10 ounces). The non-concentrate beverage, after opening, should be consumed within about a 24-hour period.

The fiber supplement beverage composition of the present invention overcomes the disadvantages of currently available fiber supplements by providing a substantially uniform mixture and preferably solution of a soluble liquid fiber product directly to consumers. Presently available fiber supplements are only available as tablets and powders, which when prepared for consumption result in gritty, coarse mouthfeel. One embodiment of the instant invention is provided as a liquid concentrate composition requiring the addition of a liquid diluent such as water before consumption. The cellulose ether fiber component herein described such as 400 grade methylcellulose or the like provides a fiber

supplement beverage composition of a viscosity such that thickening does not result and is accompanied by an agreeable, pleasant taste.

The active or bulking agent of the supplement are water soluble cellulose ether derivatives of cellulose of a viscosity grade rating which in an aqueous solution will exhibit a readily consumable viscosity at room temperature or lower and will not cause the viscosity of the solution to increase substantially after extended periods of storage. Cellulose ether products suitable for use in preparing the dietary supplementary fiber beverage of the invention are available in two basic types: methylcellulose and hydroxypropyl methylcellulose. All the above cellulose ether products are available in a powder form which is water soluble. Cellulose ether products thicken aqueous solutions, the viscosity of the aqueous solution being related to the specific cellulose ether molecular weight, chemical type and concentration. Cellulose ether products suitable for use in accordance with the invention are those grades which in a 2 percent concentration in water afford a viscosity which ranges from 3 to about 1500 cps. and preferably between about 50 and 1000 cps. Cellulose ether products of the same substitution type can be blended to obtain the desired viscosity. Cellulose ether products are available from Shin-Etsu, Japan, and Dow Chemical Company, Midland, Mich. Because the suitable cellulose ethers are water soluble and the viscosity of the solution is low, the fiber supplement is a liquid, not a colloidal suspension. For example, 400 grade methylcellulose is water soluble and results in a solution of low viscosity. Cellulose ethers of 400 grade viscosity have been found to substantially reduce aftertaste and coarseness or "mouthfeel" of the fiber supplement prepared therefrom, thus rendering a pleasant taste to the beverage.

Exemplary suitable water soluble cellulose ethers include food and drug quality methylcellulose and hydroxypropyl methylcellulose products of a viscosity grade rating of from 3 to about 1500 cps. although, as indicated, cellulose ether products of the same substitution type and of higher or lower viscosity grade ratings can be blended to obtain the desired viscosity.

The dietary supplementary beverage of the invention contains methylcellulose or other cellulose ethers in an amount in the range of from about 0.3 to 1.3 weight percent, preferably 0.45 to 0.55 weight percent, per serving. Further, the amount of cellulose ether must be sufficient to provide at least about one gram of fiber per ten ounce serving, preferably from one to four grams, and most preferably, about 1.5 grams of fiber per ten ounce serving.

The dietary fiber supplement of the invention also contains water and a high density liquid diluent such as olive oil, vegetable oil, glycerine and preferably fructose corn syrup, and may contain at least one antioxidant, at least one acidulant to adjust pH for pleasant mouthfeel, and a flavoring stabilizer. The liquid dietary fiber supplement concentrate composition of the invention contains a preservative such as sodium benzoate and the like. The antioxidant may be selected from the group consisting of ascorbic acid, BHA (butylated hydroxyanisole), BHT (butylated hydroxytoluene) and the like; the acidulant may be selected from the group consisting of citric acid and sodium citrate; and the flavoring stabilizer may be acacia, for example.

A natural flavoring additive may also be added to the fiber supplement and may be selected from the group consisting of lemon, lime, grapefruit, orange, tomato, pineapple, grape, peach, pear, cherry and the like. Orange flavoring provides a shelf life of at least about six months. Other flavoring additives include apple, cranberry, prune and the like which provide a shelf life of at least about two years.

The fiber supplement may also contain one or more of the following ingredients: orange juice concentrate, FD&C yellow #5, FD&C yellow #6. Each ten ounce serving contains about 140 calories and is low in sodium. A low calorie concentrate of the fiber supplement or the current invention contains only about one calorie per serving.

In addition to at least one gram of fiber, the fiber supplement of the present invention provides the following nutrition per serving (in grams) as set forth in Table 1:

TABLE 1

protein	<1
carbohydrate	35
fat	<1
sodium	0.1
potassium	0.14

Table 2 sets forth the percentages of U.S. recommended daily allowances of ingredients in the fiber supplement of the current invention.

TABLE 2

vitamin C	210%
thiamine	2%
protein	<2%
vitamin A	<2%
riboflavin	<2%
niacin	<2%
calcium	<2%
iron	<2%

The liquid concentrate form of the fiber supplement is adapted to convert to the beverage form upon the addition of a sufficient amount of water to provide at least one gram of fiber per ten ounce serving, preferably from one to four grams, and most preferably about 1.5 grams. Preferably, the mixture ratio of the liquid concentrate composition to water is 1:3, for example, two ounces of concentrate to six ounces of water, in the resulting beverage form.

More recently, we have decided that preparation, packaging and dispensing of a concentrate composition package, with instruction for the patient to dilute the concentrate composition with four volumes of water per volume of concentrate to deliver the same beverage end product amount of cellulose ether fiber such as grade 400 methylcellulose fiber per 10 ounce serving would be more advantageous. An example of a concentrate formulation which is intended for dilution 1:4 is set forth hereinbelow in Table 7. Preparation of a concentrate composition dilutable in a ratio of 1:5 and 1:6 of concentrate:water, by volume are also provided in Tables 8 and 9.

As indicated, the method of making the individual liquid beverage dosage form of the instant fiber supplement is a "cold-hot-cold" process. High fructose corn syrup solution is placed, under agitation, in a tank at a temperature of less than or equal to room temperature. All of the following steps require agitation at rates herein described during the addition of the ingredients and for about ten minutes after each ingredient addition, unless otherwise noted. The cellulose ether such as 400 grade methylcellulose or the like in powder form is

added to the high fructose corn syrup, thus creating a high fructose corn syrup-methylcellulose, hereinafter HFCS-MC, solution. Cold water at a temperature of about 50° F. or less is added to the HFCS-MC solution. The antioxidants and acidulants are individually dissolved into the HFCS-MC solution. The natural flavors are then added.

The HFCS-MC solution is packaged into individual containers and tunnel pasteurized at about 156°–158° F. for a period of time in the range of 10–15 minutes to sterilize the solution and is immediately cooled to a temperature of about 50° F. for example, by refrigeration, freezing or the like. The last cooling step takes approximately eight hours by refrigeration, or two to four hours by freezing.

The liquid concentrate composition form is produced as indicated by a method which does not involve heat sterilization. The method of making the liquid concentrate composition is performed at less than or equal to room temperature. All of the following steps require agitation during the addition of the ingredients and for about ten minutes after each ingredient addition, unless otherwise noted. The cellulose ether such as 400 grade methylcellulose or the like is first dispersed with stirring at 200 to 1000 RPM, preferably at about 300 to 400 RPM for about 10 minutes in high fructose corn syrup solution, resulting in a high fructose corn syrup-methylcellulose, hereinafter HFCS-MC solution. Antioxidants and acidulants are dissolved in water and then added to the HFCS-MC solution. Preservatives are dissolved in water and then added to the HFCS-MC solution. Alternatively, sodium citrate acidulant may be added to the HFCS-MC solution with the preservatives. The natural flavors are then added.

It has been found according to this invention that it is advantageous to agitate these mixtures using stirrer speeds approximating between about 200 and 1000 RPM, preferably about 300–400 RPM in standard pharmaceutical production size mixing tanks for about 10 minutes to obtain the best wetting and distribution of the cellulose ether of suitable viscosity in the liquid mixture for long-term shelf stability storage. Lower speed stirring, say, at 50 to 200 RPM or hand mixing is unable to adequately disperse the cellulose ether such as 400 grade methylcellulose sufficiently to produce acceptable liquid products in terms of appearance, degree of cloudiness, tactility (feel) degree of oral grittiness property and amount of solid sediment or gel in the liquid product after packaging and standing. Similarly, extreme high speed mixing of the 400 grade methylcellulose/HFCS mixtures stirred at high RPM speeds, e.g. on the order 2000 to 2300 RPM produce large volumes of foam and solid particles which separate from liquid medium which particles settle when the mixture is allowed to stand.

Viscosity grades of cellulose ether having viscosity ratings higher than 1500 cps produce products which are found to be too viscous, provide an unacceptable degree of cloudiness, leave too much sediment or gel to provide acceptable liquid products.

It has been found according to this invention that the choice of a cellulose ether grade such as 400 grade methylcellulose or the like for these dietary fiber supplement compositions when used with the correct stirring rate as herein described provided a unique shelf-stable liquid beverage product that once cooled in preparation, the cellulose ether/HFCS aqueous beverage product of this invention, upon reheating to ambient temperatures will remain stable for up to about 2 years, rather than form a gel or precipitate.

If desired, the aqueous liquid form cellulose ether/HFCS products of this invention can also be mixed with food or pharmaceutical grade of ethyl alcohol in proportions up to about 50:50, by volume of the ethanol if desired, to accommodate inclusion of other alcohol soluble medicaments, taste materials or coloring agents (stabilizers, and the like) without affecting the stability of the cellulose ether in the resulting dietary fiber compositions.

The following examples provide fiber supplement compositions of the instant invention in liquid dosage beverage and concentrate forms produced by the methods of the instant invention, but are not intended to and should not be construed as, placing any undue limitations on the invention as claimed.

Table 3 sets forth an example of a preparation of the fiber supplement beverage of the claimed invention:

TABLE 3

Beverage		
Ingredient	Amount	
HFCS - 42 @ 71°	99.06	gallons
Methocel A4C	42.328	lbs.
Water	866.06	gallons
Sodium citrate F.C.C.	13.125	lbs.
Citric Acid, Anhydrous F.C.C.	24.75	lbs.
No. 404782 Naturally Flavored Orange Screwdriver Flavor	37.5	gallons
Ascorbic Acid, F.C.C.	0.84	lbs.
Total Finished Beverage	1000	Gallons

Finished Beverage Brix Value = 12.0
Methylcellulose: 1.5 gram/10 fluid ounce serving
Methocel A4C = methylcellulose of 400 cps viscosity rating
Legend: HFCS-42 = High Fructose corn syrup,

The high fructose corn syrup solution was placed in a tank with the mixer below the surface of the solution. The methylcellulose was added, creating a HFCS-MC solution after stirring the resulting mixture at about 350 RPM for about ten minutes of agitation. The antioxidant and ascorbic acid, was added, followed by the addition of water to form the concentrate together with or after the addition of the acidulants, citric acid and sodium citrate, and the natural orange flavoring under constant agitation at about 350 RPM. The HFCS-MC solution is packaged into individual containers and tunnel pasteurized at about 156°–158° F. for a period of time in the range of 10–15 minutes to sterilize the solution and is immediately cooled to a temperature of about 50° F. by refrigeration, freezing or the like. The last cooling step takes approximately eight hours by refrigeration, or two or four hours by freezing.

Table 4 sets forth an example of a preparation of the fiber supplement concentrate of the claimed invention:

TABLE 4

Ingredient	Amount	
1-3 Concentrate		
HFCS-42	39.624	gallons
Methocel A4C	16.9312	lbs.
Water	45.4166	gallons
Sodium citrate F.C.C.	5.2498	lbs.
Citric Acid, Anhydrous, F.C.C.	9.9888	lbs.
No. 404782 Orange Screwdriver	15	gallons
Ascorbic Acid, F.C.C.	0.3386	lbs.
Sodium Benzoate, F.C.C.	0.4949	lbs.
Yield	100	Gallons
Solids		
HFCS-42	315.8825	lbs.
Methocel	16.9312	lbs.

TABLE 4-continued

Ingredient	Amount
Sodium Citrate, F.C.C.	3.2498 lbs.
Citric Acid	9.8999 lbs.
#404782	70.4769 lbs.
Ascorbic Acid	0.3386 lbs.
Sodium Benzoate	0.4949 lbs.
	419.2738

Brix value of concentrate = 42.4
Diluted (1:3) Brix value = 12.0
Sodium Benzoate Content of Concentrate = 1/20 of 1%

Methylcellulose in powder form was added to the high fructose corn syrup at room temperature under agitation at about 350 RPM for about 10 minutes. The antioxidant, ascorbic acid and acidulants, sodium citrate and citric acid, were added, followed by the addition of sodium benzoate and the orange screwdriver flavoring.

A further example of a formulation recipe to make a concentrate composition of this invention is set forth in Table 5.

TABLE 5

HFCS	50.572 gallons
Methocel AYC Premium	16.9312 lbs.
Water	44.428 gallons
Citric Acid, Anhydrous, F.C.C.	7.936 lbs.
Sodium Benzoate, F.C.C.	0.495 lbs.
Flavoring Material (orange screwdriver)	5.000 gallons
Yield	100.000 gallons
SOLID	
HFCS-42	403.1599 lbs.
Methocel	16.9312 lbs.
Citric Acid	7.9360 lbs.
Sodium Benzoate	0.4950 lbs.
TOTAL	428.5221 lbs.

BRIX = 42.06°
DILUTRO 1 + 3 = 4 = 12.01°
SODIUM BENZOATE CONTENT OF CONCENTRATE = 1/20 OF 1%

In use, it is contemplated that this concentrate composition would be diluted with water in proportion of 1 part of the concentrate to 3 parts of water, by volume. This concentrate has no ascorbic acid because we do not wish to affect the taste of the synthetic orange flavor used in these formulations.

The following table 6 presents and compares the gram amounts and percent by weight of 400 grade methylcellulose (Methocel ® brand) in grams of 400 grade methylcellulose per 10 oz. serving of the beverage strength liquid supplement (concentrate percentage of 400 grade methylcellulose shown before and after dilution of concentrate with water in proportions of 1 part by volume of concentrate with 3 parts by volume of water), and the percent by weight of the 400 grade methylcellulose in the desired diluted beverage product from either the concentrate or beverage product.

TABLE 6

400 Grade Methylcellulose (Methocel ® Brand) Content

Product Type	Methocel Content per 10 fl. oz. Serv.	Methocel w/w in Concentrate	Methocel % w/w in Finished Bevg.
Concentrate	1.0	1.14%	0.3235%
Concentrate	1.5	1.71%	0.485%
Concentrate	2.0	2.28%	0.64707%
Beverage	1.0		0.325%
Beverage	1.5		0.485%

TABLE 6-continued

400 Grade Methylcellulose (Methocel ® Brand) Content

Product Type	Methocel Content per 10 fl. oz. Serv.	Methocel w/w in Concentrate	Methocel % w/w in Finished Bevg.
Beverage	2.0		0.64707%

1 gallon of 1:3 ratio concentrate syrup = 9.9 lbs/gallon
1 gallon of 12.0° Brix finished beverage = 8.722 lbs/gallon

Presently, we are using the orange screwdriver natural flavoring but we contemplate that the flavor may be changed to partial or full synthetic orange or other flavoring as our experience and taste preferences of users of these compositions are changed.

The fiber supplement of the current invention increases the volume of the intestinal contents by a number of mechanisms. The fiber supplement adds bulk, and thus differs from laxatives, because it is not digested and because methylcellulose and the like cellulose ethers hold water, swelling upon the absorption of water. It also increases bacterial mass due to fermentation and exerts mechanical effects by way of increased peristalsis (intestinal movement or churning).

As such, the fiber supplement of the current invention is useful as a first line of therapy for hemorrhoids. The claimed supplement increases fiber in the diet and thus aids in the management of irritable bowel syndrome and diverticulosis. It is also helpful to children and adults who need help in naturally regulating their bowel habits from constipation and diarrhea. The fiber supplement may also confer protection from hiatal hernia formation and colon cancer and breast cancer.

In addition, this invention also provides more concentrated liquid fiber supplement concentrate compositions which were formulated to determine a reasonable practical limit of the degree of concentrate concentration of the cellulose ether fiber and the high density liquid diluent and other additives, which can be adapted to a convenient, practical concentrate container and still be adapted to convert easily to the beverage form of the product upon the addition of the instructed amount of water. These additional concentrate forms of the product can still provide the desired beverage concentration of at least one gram of cellulose ether fiber such as 400 grade methylcellulose or the like per 10 ounce serving of the beverage form, preferably from one to four grams, most preferably 1.5 to 2.0 grams of the cellulose ether fiber per 10 ounce serving of the beverage form of the product when diluted as instructed on the concentrate package label. All of these concentrate formulations are intended to be diluted with from at least 3 volumes of water per volume of the packaged concentrate up to the volume limit which provides practical acceptability in terms of dosage and taste acceptability to the patient. As a practical matter, we have made concentrate formulations which can be diluted with from about 3 to about 6 volumes of water per volume of concentrate, as would be on the package label, and still have acceptable taste, mouth feel and general acceptability.

To test and illustrate more concentrated forms of the concentrate product, liquid concentrate compositions were prepared for use according to instructions for dilution at volume/volume ratios of the concentrate composition to water of 1:4, 1:5 and 1:6 to still obtain a beverage form of cellulose ether fiber such as the product having at least the one gram of cellulose either such

as grade 400 methylcellulose fiber per 10 ounce serving of the beverage form of the product. With these concentrate formulations and with these indicated dilution ratios, the solubility of the methylcellulose fiber was achieved at all these ratios without altering the fiber quantity or the mouthfeel of the finished beverage product or solubility of the methylcellulose fiber therein.

Further concentration of the concentrate form of the product would necessitate a further reduction of water from the concentrate formulation (assuming the brix number/percent solids remained unaltered) for any further dilution amount by the consumer and would make both the concentrate composition and any resulting beverage form of the product unsuitable for uniform composition preparation and use. The only way to achieve a concentrate form of the product having a higher concentration of the concentrate formulation solids would be to change the percent of solids (syrup brix number) which would result in a thin, dilute flavor of the resulting more dilute beverage form of the product which would be unacceptable for public acceptance.

Tables 7, 8 and 9 hereinbelow set forth examples of concentrate formulations of this invention which can be diluted with 4, 5 and 6 volumes of water, respectively, per volume of the respective concentrate formulation, as the patient would be instructed to do, to make the respective beverage form of the product, before consuming that respective beverage form product. These resulting beverage forms are designed to provide the same beverage end product amounts of methylcellulose fiber as do the beverage formulations made from concentrates described hereinabove which are to be diluted with three volumes of water per volume of concentrate. Also, these additional concentrate formulations are made using the same stirring rates and times as are those indicated hereinabove for the concentrate products which are made for dilution with three volumes of water per volume of concentrate.

TABLE 7

1–4 Concentrate

Ingredient	Amount
HFCS - 42 @ 71°	61. gallons (U.S.)
Methocel A4C Premium (Methylcellulose 400)	21.164 lbs. (avoir.)
Water	35.40 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.514 lbs.
Citric Acid, Anhydrous FCC	9.94 lbs.
No. 422921 Orange Cloud ® Flavor	1. gal. (36.5 fl. ozs.)
Yield	100 gallons

Syrup Brix 50.95
Syrup Refractometer Brix 50.18
Sodium Benzoate content of Concentrate = 1/20 of 1%

This concentrate formulation, when diluted with 4 volumes of water per 1 volume of the concentrate, as instructed, will provide about 1.5 gram of methylcellulose per 10 ounce serving.

A concentrate formulation, such as this formulation, to be diluted about 1:4 with water is a preferred embodiment of the concentrate composition of this invention.

TABLE 8

1:5 Ratio Concentrate

Ingredient	Amount
HFCS - 42 71°	61. gallons (U.S.)
Methocel A4C Premium (Methylcellulose 400)	21.164 lbs. (avoir.)
Water	18.73 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.445 lbs.
Citric Acid, Anhydrous FCC	9.94 lbs.
No. 422921 Orange Cloud ® Flavor	1. gallon, (36.5 fl. ozs.)
Yield	83.333 gallons

Syrup Brix (not determined)
Syrup Refractometer Brix (not determined)
Sodium Benzoate content of Concentrate = 1/20 of 1%

Upon dilution, 5 volumes of water to 1 volume of this concentrate, a 10 ounce serving will provide about 1.5 grams of methylcellulose per 10 ounces of beverage.

TABLE 9

1:6 Ratio Concentrate

Ingredient	Amount
HFCS - 42 71°	61. gallons (U.S.)
Methocel A4C Premium (Methylcellulose 400)	21.164 lbs. (avoir.)
Water	6.836 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.395 lbs.
Citric Acid, Anhydrous FCC	9.94 lbs.
No. 422921 Orange Cloud ® Flavor	1. gal. (36.5 fl. ozs.)
Yield	71.4285 gallons

Syrup Brix (not determined)
Syrup Refractometer Brix (not determined)
Sodium Benzoate content of Concentrate = 1/20 of 1%

When diluted with 6 volumes of water per volume of this concentrate, a 10 ounce beverage concentration serving will contain about 1.5 grams of methylcellulose per 10 ounce serving.

Concentrate formulations prepared with a variety of cellulose ether products and viscosity grades are set forth in the following examples reported in Tables 10, 11, 12 and 13. The concentrate formulations are prepared using the same stirring rates and times indicated hereinabove for preparing concentrate formulations with the methylcellulose grades reported.

TABLE 10

1–4 Concentrate

CS-42, 71°	58.5 gallons
Methocel A15LV Premium (Methylcellulose 15 cps grade)	42.328 lbs.
Water	36.4 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.514 lbs.
Citric Acid, Anhydrous	9.94 lbs.
No. 812921 Natural Orange Cloud ® Flavor	1. gal. (36.5 fl. ozs.)
Yield	100 Gallons

Syrup Brix 50.95
Syrup Refractometer Brix 50.18
Finished Beverage Brix 12.0
Sodium Benzoate content of concentrate = 1/20 of 1%

This concentrate formulation, when diluted with 4 volumes of water to 1 volume of concentrate will provide about 1.5 grams of cellulose ether fiber per 10 ounce serving.

TABLE 11

1–4 Concentrate

HFCS-42, 71°	52.35 gallons
Methocel E15LV Premium (Hydroxypropyl Methylcellulose 15 cps grade)	21.164 lbs.

TABLE 11-continued

1-4 Concentrate	
Water	44.05 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.514 lbs.
Citric Acid, Anhydrous	9.94 lbs.
No. 812921 Natural Orange	1. gal. (36.5 fl. ozs.)
Cloud ® Flavor	
Yield	100 Gallons

Syrup Brix 45.4
Syrup Refractometer Brix 44.77
Finished Beverage Brix 10.5
Sodium Benzoate content of concentrate = 1/20 of 1%

This concentrate formulation, when diluted with 4 volumes of water to 1 volume of concentrate will provide about 3 grams of cellulose ether fiber.

TABLE 12

1-4 Concentrate	
CS-42, 71°	52.35 gallons
Methocel F50LV Premium (Hydroxypropyl Methylcellulose 50 cps grade)	21.164 lbs.
Water	44.05 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.514 lbs.
Citric Acid, Anhydrous	9.94 lbs.
No. 812921 Natural Orange	1. gal. (36.5 fl. oz.)
Cloud ® Flavor	
Yield	100 Gallons

Syrup Brix 45.4
Syrup Refractometer Brix 44.77
Finished Beverage Brix 10.5
Sodium Benzoate content of concentrate = 1/20 of 1%

This concentrate formulation is used by diluting 1 part concentrate with 4 parts of water.

TABLE 13

1-4 Concentrate	
HFCS-42, 71°	52.35 gallons
Methocel K100LV Premium (Hydroxypropyl Methylcellulose)	21.164 lbs.
Water	44.05 gallons
Sodium Citrate, Anhydrous FCC	6.56 lbs.
Sodium Benzoate FCC	0.514 lbs.
Citric Acid, Anhydrous	9.94 lbs.
No. 812921 Natural Orange	1. gal. (36.5 fl. oz.)
Cloud ® Flavor	
Yield	100 Gallons

Syrup Brix 45.4
Syrup Refractometer Brix 44.77

This concentrate formulation is used by diluting 1 part concentrate with 4 parts water.

While this invention has been disclosed with reference to specific embodiments, it is apparent that other embodiments and equivalent variations of this invention may be devised by those skilled in the art without departing from the true spirit and scope of this invention. The appended claims are intended to be construed to include all such embodiments and equivalent variations.

What is claimed is:

1. A process for preparing a dietary fiber supplement aqueous liquid, water-dilutable, concentrate composition containing about 1.0 to about 5.0 percent w/v of cellulose ether fiber which comprises,

(a) mixing a water soluble cellulose ether having a viscosity rating of 3 to about 1500 cps. with a high density liquid diluent in proportions ranging from about 1 to 4 parts by volume, of said high density liquid diluent to one part by weight of said cellulose ether and in an amount sufficient to provide 1.0 to about 5.0 percent w/v concentration of cellulose ether fiber in the finished concentrate composition, at a stirring rate of from about 200 to 1000 RPM for a time sufficient to obtain a substantially uniform mixture of said cellulose ether and said high density liquid diluent,

(b) mixing water with the mixture from step (a) while stirring the mixture at a rate from about 200 to 1000 RPM in an amount of water and for a time sufficient to provide a substantially homogenous concentrate composition having long-term shelf stability storage properties, which concentrate composition, when diluted with at least 3 volumes of water per volume of the concentrate composition up to a volume of dilution water which provides a resulting end product beverage composition of practical acceptability containing from about 1 to 4 grams and from about 0.3 to about 1.3 weight percent of cellulose ether fiber per 10 ounce serving of said resulting beverage strength composition.

2. The process according to claim 1, wherein in step (b) the mixture from step (a) is mixed with from 3 to 6 parts of water per part of the step (a) mixture, by volume, to prepare said concentrate composition.

3. The process according to claim 1, wherein the high density liquid diluent is selected from the group consisting of high fructose corn syrup, olive oil, vegetable oil and glycerine.

4. The process according to claim 3, wherein the high density liquid diluent is high fructose corn syrup (HFCS).

5. A concentrate composition prepared by the process of claim 3.

6. The process according to claim 1, wherein in step (a) at least one additive selected from the group consisting of an antioxidant, a preservative, an acidulant, a flavoring agent, a stabilizer and mixtures thereof is added to the mixture of the cellulose ether and the high density liquid diluent while stirring at from about 200 to 1000 RPM for a time sufficient to obtain a substantially uniform mixture.

7. The process according to claim 6, wherein in step (a) and in step (b) the mixture is stirred at a rate from about 250 to 500 RPM.

8. The process according to claim 7, wherein in step (b) sufficient water is added to prepare a concentrate composition for packaging, which packaged concentrate will be labeled with instructions for dilution of the concentrate composition with about 4 volumes of water for each volume of concentrate in preparing a resulting beverage composition for consumption by a patient.

9. A concentrate composition prepared by the process of claim 8.

10. The process according to claim 7, wherein in step (b), sufficient water is added to prepare a concentrate composition for packaging, which packaged concentrate will be labeled with instructions for dilution of this concentrate composition with about 5 volumes of water for each volume of concentrate in preparing the resulting beverage composition for consumption by the patient.

11. A concentrate composition prepared by the process of claim 6.

12. The process according to claim 1, wherein in step (a) the water soluble cellulose ether is selected from the group consisting of methylcellulose and hydroxypropyl methylcellulose.

13. A concentrate composition prepared by the process of claim 12.

14. A concentrate composition prepared by the process of claim 1.

15. A process for preparing individual packaged servings of a dietary fiber supplement beverage composition containing from about 0.3 to 1.3 weight percent of cellulose ether fiber and from about 1 gram to about 4 grams of said cellulose ether fiber per ten ounce serving, which comprises:

(a) mixing a water soluble cellulose ether having a viscosity rating of 3 to about 1500 cps with a high density liquid diluent in proportions ranging from about 1 to 4 parts by volume, of said high density liquid diluent to one part by weight, of said cellulose ether at a stirring rate of from about 200 to 1000 RPM for a time sufficient to obtain a substantially uniform mixture of said cellulose ether and said high density liquid diluent;

(b) while continuing to maintain essentially the same stirring rate, adding to said mixture from step (a) at least one additive selected from the group consisting of an antioxidant, a preservative, an acidulant, a flavoring agent, a stabilizer and mixtures thereof to the mixture of the cellulose ether and the high density liquid diluent;

(c) mixing water with the mixture from step (b) in an amount sufficient to provide a beverage composition while stirring the mixture at a rate from about 200 to 1000 RPM for a time sufficient to provide a substantially uniform beverage composition;

(d) packaging the beverage composition from step (c) into individual serving package containers;

(e) pasteurizing the beverage composition in the packaging containers; and

(f) cooling the resulting pasteurized beverage composition to a temperature at least as low as 50° F. and maintaining such temperature for a time necessary to prepare a beverage composition with shelf storage stability for extruded periods of time.

16. The process according to claim 15, wherein the high density liquid diluent is selected from the group consisting of high fructose corn syrup, olive oil, vegetable oil and glycerine.

17. The process according to claim 15, wherein in step (a) the water soluble cellulose ether is selected from the group consisting of methylcellulose and hydroxypropyl methylcellulose.

18. The process according to claim 17, wherein said water soluble cellose ether has a viscosity rating of from about 50 to 1000 cps.

19. A dietary fiber supplement beverage composition prepared by the process of claim 18.

20. A dietary fiber supplement beverage composition prepared by the process of claim 15.

21. A dietary fiber supplement beverage composition comprising a homogeneous aqueous mixture of a high density liquid diluent, a water soluble cellulose ether having a viscosity rating of 3 to about 1500 cps and water, said high density liquid being present in an amount of from about 1 to 4 parts by volume to 1 part by weight of said cellulose ether and said composition containing an amount of water sufficient to provide a consumable beverage composition containing from about 1 to 4 grams of cellulose ether dietary fiber per beverage dosage of about 10 ounces.

22. The dietary fiber supplement beverage composition according to claim 21, wherein said high density liquid diluent is selected from the group consisting of high fructose corn syrup, olive oil, vegetable oil, and glycerine.

23. The dietary fiber supplement beverage composition according to claim 21, wherein said water soluble cellulose ether is selected from the group consisting of methylcellulose and hydroxypropyl methylcellulose.

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